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MINOT COMMON BATTERY BALLAST EXCHANGE

Description of Equipment Installed by the Minot Light and Telephone Company, Minot, North Dakota

By E. M. Rothelle

A GREAT amount of interest has been manifested in the telephone field among the engineers, manufacturers and operating managers regarding the common battery ballast switchboard brought forward by the Vote-Berger Company some time past. The interest of the telephone field has accordingly been centered in the installation of a large multiple board of this type recently installed at Minot, North Dakota.

Since the first proposal of the use of incandescent lamps for signals in telephone work, which is generally credited to Mr. J. J. O'Connel of the Chicago Telephone Company, a great deal of research work has been done for the purpose of devising some method whereby lamp signals could be worked on telephone switchboards without the use of relays.

It was as evident, at the time the lamp signals were first proposed, as it is to-day, that the placing of incandescent lamps in series with the subscriber's line and central battery was the ideal system of lamp signalling. Difficulty was experienced in the past on account of the variation of resistance of subscriber's line circuits. This subject is taken up somewhat in detail in Mr. Kempster B. Miller's American Telephone Practice, under the chapter on Lamp Signal Switchboards.

While it was possible to arrange resistances in the shorter subscriber's lines to make them equal in resistance to the longer lines, it has been found impossible to protect these long lines in cases where they were short circuited or grounded near the exchange itself. Under such conditions the line lamp would be burnt out almost instantaneously, if there was sufficient battery on the board to give a good signal over a long subscriber's line. There were a number of attempts at equalizing line resistance, and numerous patents are on record at Washington showing the methods devised by various inventors to accomplish this result. An employment of large wires for long lines and small wires for short lines serves the basis for a number of these inventions. The grouping of a number of lines of approximately the same resistance on the battery of certain voltage, and the grouping of a second set of lines of higher resistance on a second set of batteries of higher voltage forms another basis for accomplishing the second result. Still a third method, which was the most practical of the three, was the testing of each individual line and placing in series with all of the shorter lines a fixed resistance at central office that would make them equal or approximately equal to the long lines, formed the basis for a third class of inventions. In none of these cases, however, was there disclosed any method by which a resistance, which would be the same for each line, could be placed in series with each of the subscriber's lines so that these resistances would automatically take care of any conditions that might arise.

After years of effort along these lines a relay was adopted as a circuit closer for lamp signals, which, although acknowledged to be not as efficient and as simple as would be the direct lamp circuit, was found to be the only practical method of operating incandescent lamp signals at that time.

Something like three years ago Mr. C. D. Enochs, then with the Western Electric Company, Chicago, invented a device which could be placed in series with a subscriber's line and which would automatically adjust itself to any line condition that might arise. This is what has been termed the iron wire ballast.

An iron wire ballast had been used previously to this by the Nernst Lamp Company in protecting the filament of rare earth used in the Nernst type of lamp. In this ballast an iron wire is mounted on porcelain disks in a glass bulb filled with hydrogen gas. The ballast is designed to carry 0.4 of an ampere at its sensitive point. When carrying this amount of current the wire is at its critical point and a slight fluctuation of current will give a decided change of resistance in the iron wire and hence protect the filament of the lamp from changes in voltage. As it is manifest that it is impractical to operate telephone lamps with 0.4 of an ampere, this type of ballast cannot be considered for telephone use. To operate in series with telephone signal lamps, it is evident that the ballast must be at its most critical point at something less than 0.1 of an ampere.

A ballast was designed by Mr. Enochs in which the iron wire is carried by a threaded glass tube which is mounted in a glass bulb in which the vacuum is established. In this type of ballast it is possible to heat the wire to a far greater degree than is possible in the Nernst type of ballast, for this reason: In the Nernst ballast, if the temperature is carried to such a point that the wire tends to become soft it will break in two from its own weight. With the Enochs ballast if the wire is heated to this same temperature the wire will droop down and touch the glass tube, and the point which is hottest will be cooled by contact of the glass, and another portion of the wire will in turn be heated. The result is a continuous high temperature of the ballast as a whole, athough the individual portions of the wire may be alternately heated and cooled. In the Nernst ballast it is possible to get a variation in resistance of one hundred per

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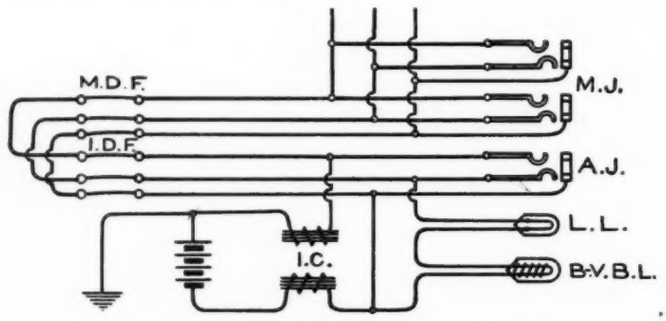
cent by slight increase of current, and this variation is sufficient to care for the changes in voltage experienced with the Nernst lamp. In the Enochs ballast it is possible to get a variation of one thousand per cent with slight variations of current and this is far in excess of what is needed on telephone lines. With the design of the ballast completed, the solution of the problem of placing the line lamp directly in series with the subscriber's line was solved. It



Lamp Ballast Line and Current Supply Circuit.

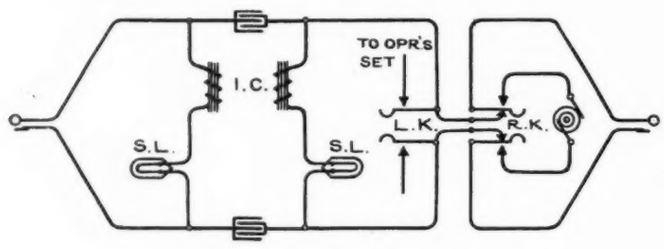
only remained to elaborate circuits to meet all working conditions, and this has been done by the Vote-Berger Company, and the circuits are now working at Minot.

With the line circuit reduced to absolute simplicity, it was recognized that a cord circuit without a relay would make the board as simple as a telephone switchboard could possibly be designed.

Mr. Enochs perfected this arrangement by bridging a lamp in series with an impedence coil across the cord circuit and shunting this lamp by the resistance of the subscriber's loop. This circuit has been so designed that it will give a good positive disconnect signal that will be shunted entire dark on a line of maximum length. Some time since the Vote-Berger Company acquired from Mr. Enochs the patents for the ballast as applied to signaling circuits of all descriptions.

A number of small exchanges were installed as long as two years ago and have given perfect results. In fact, on account of the simplicity of the circuits it is stated that there have been very few cases of trouble in any of the switchboards installed with the single exception of the unavoidable cord wear.

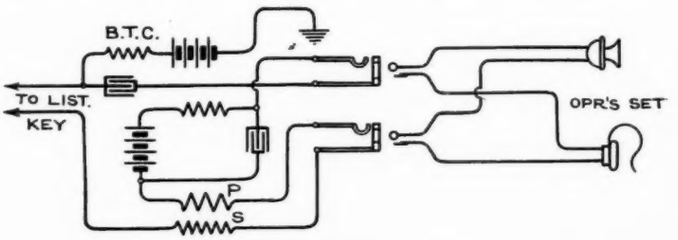
Although the technical public acknowledge from the operation of these small boards, that the ballast was a success in the telephone field, yet a great deal of interest has been expressed, especially by managers and the non-tech-



Lamp Ballast Cord Circuit.

nical men as to the operation of this system on a board of large size.

The Minot Light & Telephone Company, Minot, North Dakota, is a corporation giving telephone, electric light, power and city heating service. The plant is thoroughly up to date in every respect and gives first-class service in each department. Joseph J. Barclay of Minneapolis is president of the company, Frank Clark of Minot, vice-president, and L. M. Davis, secretary, treasurer and manager. L. V. Gray, superintendent and engineer of the entire plant, is thoroughly up to date in best practice of both lighting and telephone engineering. Minot is a hustling western city of about 7,000 inhabitants and is growing at a remarkable rate. The telephone exchange has developed from a small magneto exchange to one of 800 operating lines with a growth of from fifty to seventy-five telephones per month. The original magneto exchange consisted of only seventy-five lines and operated for several years, when it was replaced by a visual signal central energy switchboard of 600 capacity. This board was discarded in favor of a lamp signal board, the common battery ballast board manufac-

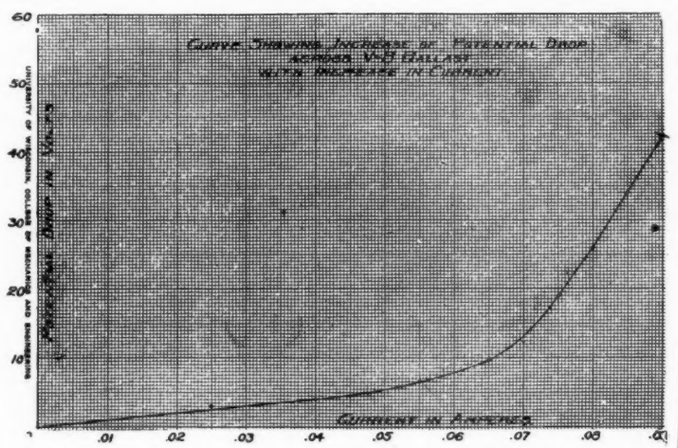


Operators' Telephone Circuit.

tured by the Vote-Berger Company, La Crosse, Wisconsin, being chosen to replace it.

The central office equipment consists at the present time of an eighty-volt central battery, one-half horse-power Roth ringing machine, one charging panel, an American Electric Fuse Company's fuse protector rack, and a 3,200 ultimate capacity Vote-Berger Company ballast switchboard. As no relay rack was used in the system, the room needed in the exchange was less than ordinarily found necessary, and this, with a company such as the Minot Light & Telephone Company, operating the three lines of business in one building, was in itself an important factor.

The switchboard is built with a substantial iron frame work made of channel and angle iron so as to give absolute rigidity and strength. Cabinet work is of high grade quarter-sawed finish in dull finished style; the effect of the board is extremely pleasing, the design being somewhat in the line of mission style, so popular among lovers of good furniture. An obvious advantage of this dull finish for switchboards, which has been appreciated by the telephone manager, is that it will stand wear and rough usage without showing any scratching or marring upon its surface, whereas a varnished board, no matter how well finished, will show scratches, through impact of plugs where they fall outside of the leather facing ordinarily used to protect the



Change of Resistance with Increase of Current.

keyboard. The dull finish of board will not show the effect of such usage.

The present equipment consists of three sections with one hundred and forty lines to each position, with fourteen cord circuits equipped. The first two sections are fully equipped

with the third section in reserve. The board grows from right to left, the cable turning sections being placed within five feet of the protector rack. The farmers' position, or rural position, is placed in the sixth position of the board in conjunction with 100 common battery lines.

At present the rural lines terminating in the drops are not used, being merely held in reserve, as it has been found entirely practical to operate the farmers' lines on the common battery circuits. The line circuits as illustrated contain no relays whatever. The entire equipment of the line circuit consists of one double wound impedence coil, one line lamp, one line ballast ,and the subscriber's line in series. Multiple jacks are bridged so that no contacts whatever, except between the plug and jack, are used in the entire line and multiple circuits. The line lamp and ballast are wired between the ring and sleeve springs of the jack, and are short-circuited by the sleeve of the two-way plug when it is inserted in the answering jack or multiple jacks. The design of the circuit is such that the line lamp gives a perfect signal over lines as high as 1,000 ohms resistance, and it is operated in Minot on farmers' lines sixteen miles in length. The farmers' lines are built with No. 12 iron wire, and as trees are very scarce in the country around Minot, common battery service is far superior to magneto service. The iron wire ballast in series with the lamp is so designed that in case one of these long farmers' lines is short circuited inside of the exchange, the ballast will fully protect the line lamp from more voltage than it is designed to withstand in continual service. The cord circuits consist of two-way plugs and cords with condensers separating the answering and calling cords in the manner well known to the art.

For the supervisory signals there is bridged across each cord in series, a supervisory lamp and impedence coil, so that the circuit is absolutely free from battery or ground. Each cord circuit is equipped with a four-party ringing key, the signaling system being of the pulsating current type.

The supervisory signal is obtained as follows: Battery flows through the impedence coil on one side of the line through the cord, from there through the impedence coil and lamp in series bridged on the cord to the impedence coil on the opposite side of the line to grounded battery. The design of these coils and lamps is such that the lamp is shunted absolutely dark on the longest farmers' lines. It will be noted here, that for supervision, as well as for line signaling, there are no contacts whatever. The keynote of the switchboard throughout is simplicity. No contacts, no moving parts, nothing to adjust, consequently the trouble or chances for trouble are reduced to an absolute minimum.

The busy test is obtained in the usual manner from the tip of the cord to the sleeve of the jack, and is accomplished by a busy test impedence coil through which battery is fed through the tip of the plug when operator's key is thrown to a listening position. In case of a calling subscriber this gives a busy test as soon as the subscriber takes his telephone off the hook before the operator has answered. In case of a called subscriber this gives a busy test as soon as the operator plugs into the jack before the subscriber has answered. The circuit is practically noiseless, as the battery circuit is never broken or reversed.

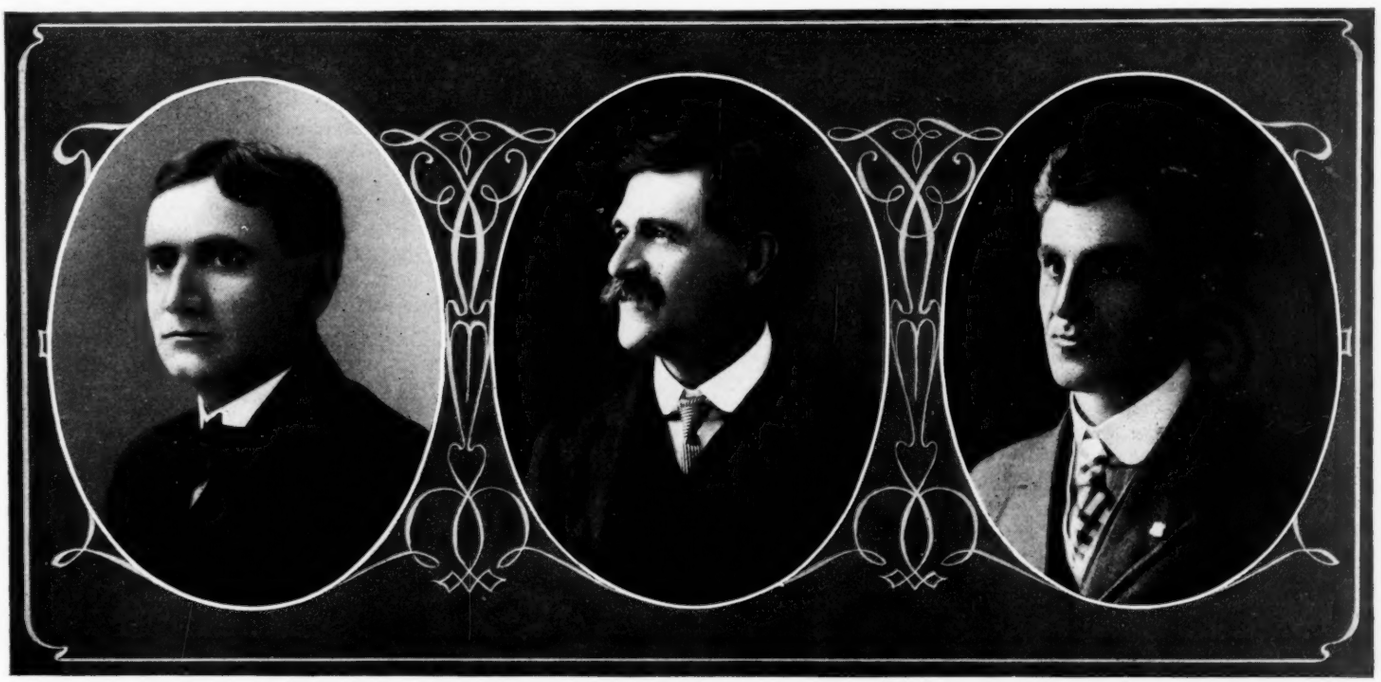
Transmission is perfect and shows up to special advantage on long lines, on account of the voltage used on the system. The multiple jacks as shown in the illustration are extremely rigid and simple. In addition to this the jacks are very accessible.

By the removal of a few screws from the reinforcement strip on the top of a bank of jacks, all of the individual jacks are exposed to inspection without changing the adjustment of any jack. Answering jacks and lamp jacks are built on the same plan, so that any case of trouble on any one of the jacks in the strip can be repaired without changing the adjustment of the remainder of the jacks.

The ringing key is built in a frame of one solid piece of steel, and is so constructed that there is no possibility of the key becoming loose or unstable through wear.

The ballast as illustrated shows the construction as already described, which allows a large variation in resistance with an extremely small change of current.

The installation of this board which was accomplished without display, is one of the important steps in the advance of the telephonic art. As already stated, it has long been admitted by engineers that the ideal telephone system would be one without relays, and in which the line lamp was placed directly in the subscriber's line. This was attempted years ago and failed only on account of the lack



L. M. Davis, secretary, treasurer and manager. Frank C. Clark, vice president. L. V. Gray, superintendent.
Officers of the Minot Light and Telephone Company, Minot, No. Dak.

of a suitable protection of the line lamp. The development of the iron wire ballast has solved this question. The plot of the curve showing the change of resistance with increase of current will probably be of interest to engineers who have not personally investigated the operation of this ballast.

The iron wire is so small that the change of resistance is instantaneous, so that the line lamp is absolutely protected under all conditions. In addition to the use of the ballasts in the line circuits, they have been adapted to regulate the voltage of the operator's ringing leads in case one of them should ring on a line that was short circuited. Two types of ballasts are manufactured for this purpose, one designed for machines giving 50 volts under full load, the other for machines giving 125 volts under full load. These ballasts are equipped with Edison bases, so that they can be fitted in the sockets ordinarily installed where carbon resistance lamps have been used previously. With a carbon resistance lamp protecting the operator's voltage, we have a dead resistance of at least 600 ohms when ringing upon lines in normal conditions. When ringing upon a line that is short circuited this resistance drops to 400 ohms. While this is sufficient to protect the voltage of the ringing machine, the 600 ohms that is present under normal conditions is absolutely a waste, that has been accepted merely for the purpose of having 400 ohms a few times a day to protect against short circuit. With a ballast the resistance under normal conditions is only twenty to 30 ohms, and hence there is no loss in ringing current when ringing subscriber's bells. In case the operator rings upon a short circuited line the resistance of these ballasts increases to 400 ohms and protects the voltage of the ringing machines.

It will be of interest to any telephone engineer or manager whether contemplating the purchase of a board or not to examine the operation of the Minot switchboard. When a person stands in front of the board and watches the perfect operation of the board, and then passes to the rear of the board and notes the absence of all moving parts, contacts or anything that could possibly get out of adjustment or cause trouble, he must admit that here is one of the remarkable improvements brought forward in telephony. The circuits are so simple, and the possibility of trouble so remote that an exchange of 3,000 to 5,000 lines may be maintained by comparatively low priced help.

Eliminating cord trouble and key adjustment, which will be the same as in other boards of first-class manufacture, there is absolutely no occasion for any repair work on the switchboard, as no relays form a part of it.

The circuits as installed are printed herewith, and we believe will be of great interest to telephone workers on account of their simplicity. It is claimed the operation of such a system will save a large amount of money in maintenance expense and will either allow the reduction of telephone rentals with the result of increase of business or the increase of net profits, whichever in the judgment of the manager may be deemed most desirable.

"HONEY CATCHES MORE FLIES THAN VINEGAR."

BY J. L. BACON, JR.

Telephone men know how important it is that uninsulated aerial wires shall not run through trees, and this is particularly true of toll lines.

One rainy morning last week I reported, as usual, to the toll line wire chief. I found my assistant already there, and after the customary morning greetings, Mr. Harry, our wire chief, said:

"Sickly, '69' is unusually noisy this morning. I wonder what in the deuce is the trouble now? My tests show mighty poor insulation."

"Well," I answered, "I suppose it is due to the big sugar maples on old Ezra Rube's farm."

"That's probably it," said Harry, "as it measures about a mile and three-quarters this side of Southport; but never mind it to-day."

The next morning Harry said that the "big guns" had been down to see Ezra and he had said that he would shoot the first man that tried to trim his trees. This was all there could be done about it and we would have to change our Columbus lead, at a large expense, or give the public poor service at reasonable rates. I started out to patrol the Columbus lead and took my assistant, Mr. Ham, along with me.

I noticed on the way that Ham was in a particularly thoughtful frame of mind. When he asked, "Has Ezra a telephone?" I knew he was thinking about those maple trees. I answered that he was on a rural line, as he did a pretty large egg business in Indianapolis. Ham said: "Sickly, I think I can get permission to trim those trees." I let him dream on, because he was one of those eastern college boys that know a lot about theory and all that, but when it comes to serving a five-eighths-inch messenger those fellows are not in it.

About a mile from Southport we saw Ezra sitting under one of the troublesome shade trees. Coming nearer he arose and came toward us. He had a big chew of tobacco in his mouth, and blood in his eyes.

"I'm waitin' fer ye," he sputtered. "Ef yew fellers touch one twig of them trees, I'll fill ye full of lead."

Ham got off the wagon and asked me to drive on ahead. When I drove back some time later after Ham, there they were sitting under the same tree and beside Ham was a basket of eggs. The trees were all trimmed and cleared our lead by three feet.

I got Ham in the wagon, eggs and all, and when we were out of hearing from Ezra I asked:

"Well, how in the world did you do it?"

"I did not do it at all," said Ham; "I let him do it himself. When you left me," he continued, "Ezra wanted to know if we had any trouble down that way. I asked him if he had noticed any noise on his line lately, and I knew he would say yes, for a subscriber is always ready to register a kick. He did. I told him that our chief operator had been trying to get him all the morning, but the line was too noisy to talk over, so the chief had left an order for ten dozen of eggs with me, as I said that I would bring them to him. He got me the eggs and I gave him $1.70 for them. Then he said: 'What do you suppose is the trouble with the darned machine?' I told him that there was not a thing the matter with the telephone, but I thought that if he cut off a limb or two from his trees he would have no more trouble. He hurried off to the shed, got a handsaw, and cut every limb that came near our lead. When he came down he told me about his rheumatics, his crops, his pigs, and his wife; and about being in the war and locked up in Libby prison for three months. You know I have the rheumatism; father raises crops and stock; I have not got the wife, but I'm looking for one; and I had an uncle that was in the war and he was in Elmira prison for four months. So you see we got along pretty well together, and it all comes from the old adage so often repeated by one of our worthy officials, 'Honey catches more flies than vinegar.'"

A marriage by telephone is illegal, according to the decision of the Nolan County (Texas) Court, and as a result the estate of Thomas Wemberly, a wealthy ranchman, valued at over $200,000, is tied up and cannot be settled. When Wemberly died a contest of the will was made. The question of the legality of a marriage performed by telephone was raised, and the court held that a marriage ceremony, to be legal, must be solemnized by a minister or other authority in the presence of the contracting parties and witness.

MANSON'S PRACTICAL SUGGESTIONS

A Series of Short Articles Dealing with Important Phases of Telephone Work

By Ray H. Manson

TAKING-UP Slack in Switchboard Cords.—Switchboard cords are made of a greater length than is actually necessary to reach the most extreme jack in an operator's position. This extra length is to provide for repairs at the plug end so that the cord can be cut back and rebutted as occasion demands. (The last operations were described and illustrated in these columns of the September, 1906 TELEPHONY).

There are several ways to take up slack in switchboard cords so that the cord weights will hang just clear of the floor. The most common scheme is to double back the cord near the terminal end and wind it around the doubled portion as illustrated in Figure 67. In order to do this job neatly and quickly the cord is first doubled and the free

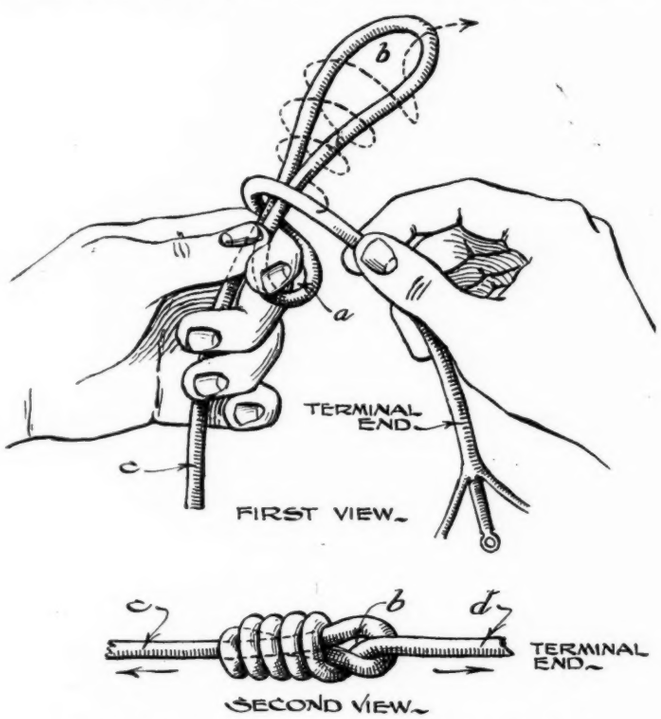


Figure 67—Taking Up the Slack in Switchboard Cords.

end held as at *a* in the first view of Figure 67, after which it is a simple matter to bind the surplus cord around the doubled portion. When a sufficient number of turns have been taken to provide for the slack, the end of the cord is passed through the loop at *b* and the two ends *c* and *d* drawn apart as indicated by the arrows, the result being shown in the second view of Figure 67.

The only precaution to be taken in making this loop is to keep it near the terminal end of the cord and to have the cord weight just clear the floor, thereby giving the use of the full length of the cord which may be required in putting up some switchboard connections.

Figure 68 shows a standard spool type of electric light cord adjuster which is used to advantage in taking up the slack in switchboard cords. This adjuster is put in place by winding the cord around its body and catching the ends in the slots *a* and *b* provided in the heads of the spool. thereby holding the turns secure. Any further adjustment necessary can be made after the cord is fastened in place to the cord rack by merely releasing one end of the same from one of the slots in the spool so as to allow additional turns to be taken or dropped, as the case may require, after which the cord is replaced in the slot.

As will be seen from the dimensions given in the illustration of this spool type adjuster it requires considerable more room than the plain loop knot previously described. This objection, however, is valid only when the cords are placed on close centers.

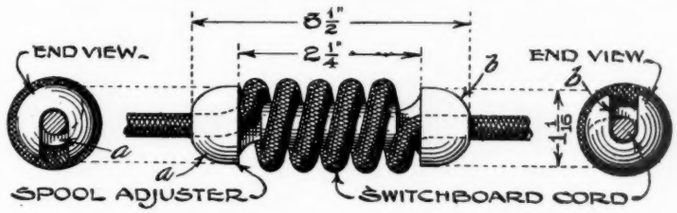


Figure 68—Spool Cord Adjuster for Taking Up Slack.

Relays for Alternating Currents.—Telephone circuit relays for operating on alternating currents require a special design differing in several details from the ordinary direct current type of relay. These structural changes are made with one end in view, that of providing a contact which will close and remain so during the entire time the current is connected to the relay winding and immediately break the contact as soon as the flow of current through the winding ceases.

The armature of the ordinary spring mounted contact relay vibrates when alternating current is connected to the winding, thereby producing a vibration of the contacts which is of such a high frequency as to prevent the proper operation of circuits in which these contacts usually are included. This is with the regular ringing currents of from fifteen to thirty-five cycles. With higher frequencies the armature will not have time to return to its normal position at each alteration of the current so that if the armature has a large mass and the contact springs are not adjusted with too great a tension the relay will operate satisfactorily.

As a matter of fact the majority of alternating currents

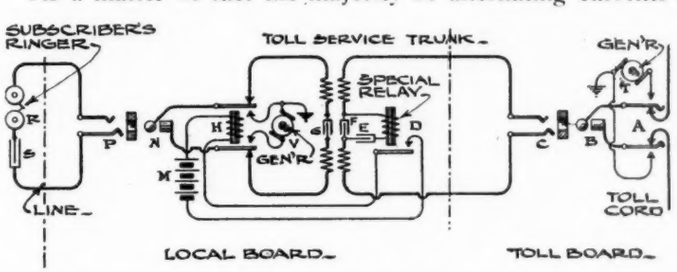


Figure 69—Toll Service Trunk Showing One of the Important Uses for an Alternating Current Relay.

used in regular exchange ringing have a frequency of less than 33 1-3 cycles, thereby necessitating a specially constructed relay so as to give safe operation on these lower frequencies.

Practically all of the successful alternating current relays make use of a massive armature construction so that the latter will be relatively slow acting, much slower in

period than the frequency of the alternating current circuit on which the relay is to operate. It follows that the lower the frequency of the alternating current the greater the mass required in the armature in order to prevent it from being sufficiently quick acting to take up a vibration in step with the changes in the current.

The full effect of the massive armature is best obtained by making use of gravity action to retain it in its normal position. As has been previously stated, the use of a restoring spring, with its tendency to increase the period of the armature, is a disadvantage and seldom used.

The following descriptions give some of the typical alternating current relay construction now in use and some examples of the circuits for which they are specially designed.

One of the most important uses for an alternating current relay is in the so-called ring-through trunk in which the incoming trunk or switching operator simply handles the putting up and pulling down of the connection, and the operator at the outgoing trunk end handles the supervision and does the ringing. These trunks have a repeating coil

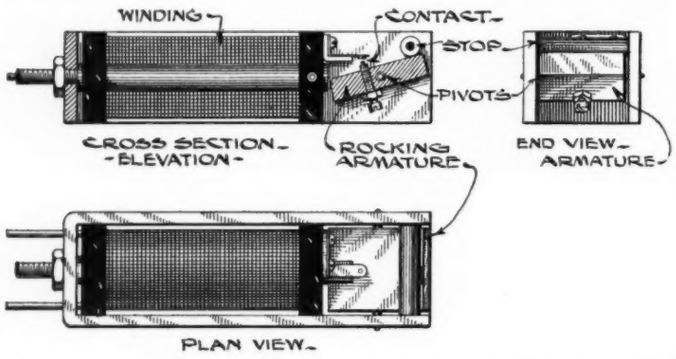


Figure 70—Alternating Current Relay With Massive Rocking Armature.

separating the two ends and other intermediate bridged apparatus so that it is desirable to use some relay scheme to transmit the ringing to the further end.

Figure 69 shows the ringing portion of a toll service trunk which illustrates the principles of the ring-through schemes. The toll operator orders the incoming trunk operator to insert the plug of a service trunk into the jack *P* of the desired line, and at the same time plugs into the outgoing end *C* of the trunk with the calling cord *B* of one of her toll cord circuits. Now by the aid of relays *D* and *H* the toll operator is able to ring the bell *R* of the desired subscriber's telephone without any further assistance.

Three complete circuit paths, inter-connected by the relays *D* and *H* of this service trunk, are established in this ringing operation. The first circuit includes the toll ringing generator *T*, operator's ringing key *A*, winding of the special alternating current relay *D* and the condenser *E*. The condenser *F*, across the middle of the repeating coil,

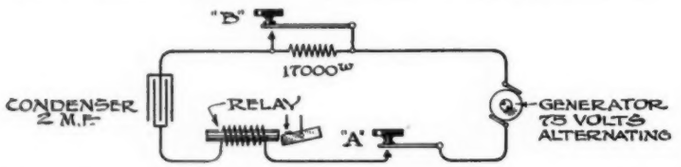


Figure 71—Circuit for Testing the Alternating Current Relay Shown in Figure 70.

is used for talking purposes only, but its presence does not shunt enough current from the relay *D* to prevent its operation. The contact of this latter relay, therefore, is closed and the second circuit, which includes the battery *M* and winding of relay *H*, is established. The operation of the latter relay thereby is brought about and its lower contact springs made to disconnect the cord end from the toll half of the trunk and establish the third circuit. This new circuit includes the main switchboard generator *V*, the desired subscriber's line, the telephone condenser *S* and the subscriber's bell *R*. Therefore, the toll operator is able to

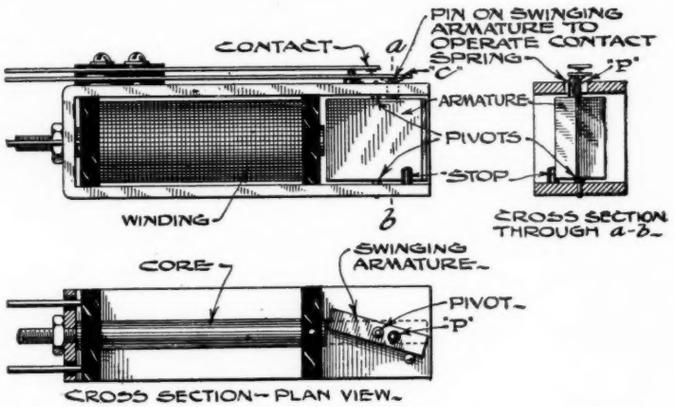


Figure 72—Another Form of Alternating Current Relay Making Use of a Swinging Armature.

ring the desired subscriber's bell by these several circuits without assistance.

The requirements of the previously described service trunk circuit are such that the special alternating current relay *D* must be positive in action and able to operate on a small current. The relays illustrated in Figures 70, 72 and 73 are especially designed for this kind of work.

Rocking Armature Type A. C. Relay.—The alternating current relay shown in Figure 70 has a single spool with a U-shaped return pole piece of Norway iron and a massive iron armature pivoted so as to rock between these pole pieces and in front of the free end of the core. A contact is provided on a light flexible spring so that positive action will be assured regardless of any slight vibration of the armature when the latter is swung up in line with the core end.

The original relay of this type had a 1,000-ohm winding of 14,000 turns of No. 36 B. & S. gauge single silk covered copper wire, and was adjusted to operate on the conditions shown in the circuit, Figure 71. In other words, when the key *A* of this test circuit is pressed the relay must operate with current from a seventy-five volt sixteen cycle generator and with a two microfarod condenser and a 17,000-ohm non-inductive resistance in series with its winding.

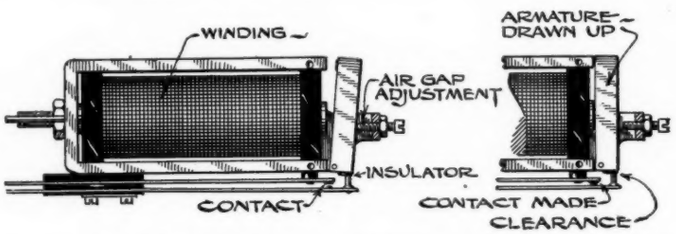


Figure 73—An Efficient Type of Alternating Current Relay With Positive Acting Contact Points.

Also the relay armature must not stick in its operated position or act too sluggish in returning from this position when the resistance short-circuiting key *B* is pressed in making the previous test.

This relay, with some slight modifications, is the standard ring-through trunk relay used by the Bell long distance telephone companies.

Swinging Armature Type A. C. Relay.—Figure 72 shows another alternating current relay, made similar to that just described, but differs from the latter in the contact action and in the use of spring pressure instead of gravity to return the armature. An insulated pin *P* is fastened in the

edge of the armature so as to project through an opening in the upper return pole piece and engage a downward projection on the lower contact spring *C*. When the armature is actuated and swung into line with the end of the core, as shown by the dotted lines on the plan view, this pin is forced under the downward projection *C* and therefore raises the lower contact spring so as to close the platinum contacts. These parts are so shaped that the action of the lower contact spring will restore the armature when the alternating current is disconnected from the winding.

Gravity Operated Spring Contact A. C. Relay.—In both of the preceding relays the armature acts against the contact spring when drawn up. Figure 73 shows a type of relay which leaves the armature free from spring action when drawn up, and for that reason allows a most positive connection between these contacts. A heavy iron gravity restored armature is used and is so pivoted as to keep the contact springs separated when in its normal position. However, when the armature is drawn up, the lower spring closes the contacts and furthermore leaves a clearance between the former and the latter so that any slight vibration of the armature will have absolutely no effect on the continuity of the circuit through these contacts.

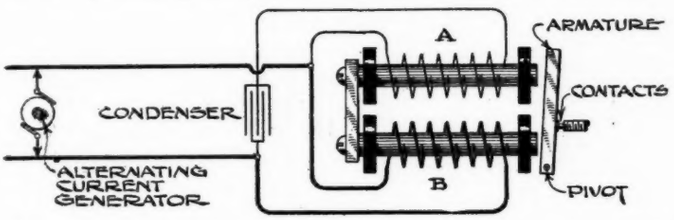


Figure 74—A Double Wound Relay Made to Operate on Alternating Currents by Placing a Condenser in Series With One of the Spools, Leaving the Other Spool Directly in the Circuit.

An early form of Alternating Current Relay.—One of the earlier forms of alternating current relays makes use of a double spool winding as illustrated in Figure 74 to produce the desired effect when used on an alternating current circuit. One of these windings is connected directly to the circuit, while the other is arranged parallel with the former, but with a condenser in series with the same. The phase difference thereby produced in the magnetic action of the two spools serves to draw up and retain the armature without the otherwise full vibration. This relay was naturally superceded by the single spool direct acting type, on account of the compactness of the latter.

A Lock-up Alternating Current Relay.—Figure 75 shows a very sensitive locking type alternating current relay which was originally designed for use in lamp signal toll cord circuits. This relay must not only work on alternating ringing currents through extremely high resistance toll lines, but on the same adjustment must not stick when connected in a local circuit with 40 volts direct current applied to its winding.

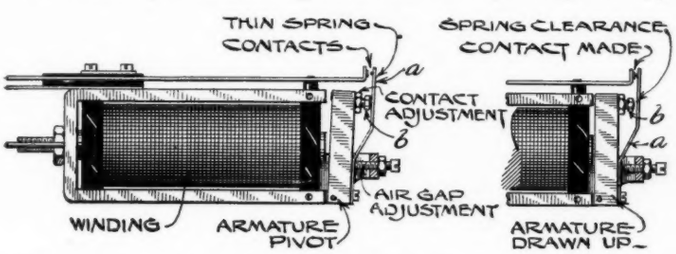


Figure 75—A Very Sensitive Alternating Current Relay Designed to Be Locked in its Operated Position by the Action of Direct Current Through a Second Winding.

These results are obtained by using a gravity operated armature of large mass provided with a contact spring *a*, Figure 75, which serves as a locking contact when the relay is used on alternating current and as a regular make-contact when direct current is used for its operation. In the latter case, the tension of the spring *a* is sufficient to quickly restore the armature when the direct current is disconnected from the winding. This contact spring is provided with an adjusting screw stop *b* which allows an initial tension of the former and which serves to maintain a positive relative position of the contact points when the armature is in its normal position. The relay is adjusted so as to leave a clearance between the screw *b* and the spring *a* when its armature is drawn up.

A toll cord circuit, requiring a relay similar to that just described and shown in Figure 75, is illustrated in a diagram in Figure 76. When this cord circuit is plugged into a multiple toll line, the same as shown at the right of this illustration, a circuit is established from the battery *D*, through the winding of the relay *C*, sleeve of plug *R*, and back to the ground side of battery through the winding of the cut-off relay *F*. The operation of the relay *C* closes its contact *G*, thereby putting the special alternating current relay in a condition to receive and lock-up clearing-out signal from a distant station. This locking circuit is established from battery *D* through the winding *B* of the alternating current relay, the closed contact *G* of the relay *C* and thence through the contact *H* on the alternating current relay and the contact *K* on the operator's listening key

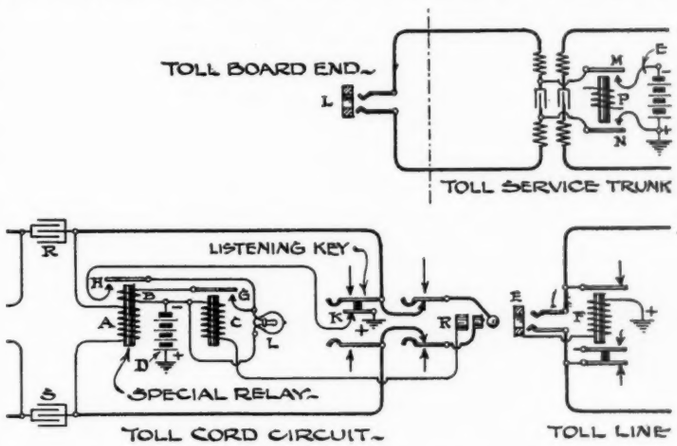


Figure 76—Some toll Switchboard Circuits Showing the Use of the Relay Illustrated in Figure 75.

to ground side of battery. Therefore, the armature of this special relay *A* is locked in its operated position as soon as it is drawn up by the action of the alternating current from the line.

A battery circuit is also established, by the closing of the contact *H* of the special relay, through the supervisory lamp *L*, thereby giving a permanent lamp signal as long as the locking circuit remains intact. The latter is broken, however, when the operator responds by throwing the listening key lever to its operated position.

When the toll cord circuit shown in Figure 76 is plugged into a service or other exchange trunk the relay *C* remains in its normal position and the locking circuit of the special alternating current relay is thus left open, due to the fact that the sleeves of the jacks of these trunks are not connected to the ground side of battery. The alternating current relay *A* is now operated on direct current instead of alternating current, the former being furnished as shown in the upper right hand circuit of Figure 76. The relay *P* of this circuit is operated through the agency of the subscriber's hook switch, its contacts remaining closed at all times when the service trunk is in use and when the subscriber's receiver is on the hook switch. Thus, when in the latter condition, the current from battery *E* flows through the service trunk to the toll cord circuit and operates the special alternating current relay *A* by means of its bridged winding.

Now, as previously explained, relay *A* is not locked in its operated position so that its action is entirely dependent on the conditions of relay *E* or the conditions of the subscriber's telephone. Thus, the toll operator receives supervision direct from the local subscriber or the distant toll office by means of the same lamp signal and without manipulating any special circuit changing switches.

It is interesting to note in this connection one of the principal requirements of a toll service trunk, which is shown in the circuit last described, that of keeping all of the battery and earth connections off the toll half of the repeating coil when the circuits are being used for talking purposes. The apparently reversed action of relay *P* thus is accounted for.

An Extension Bell A. C. Relay.—Practically all of the previously described relays are adapted to be used for operating sub-station local signaling circuits when it is desired to employ a loud ringing direct current extension bell. In this case the relay is bridged across the telephone line and the extension bell connected in a local battery circuit which also includes the relay contacts. Thus when the operator projects ringing current to line the relay will operate, close its contacts, and thereby causing the extension bell to ring.

If the switchboard is of the common battery type, a condenser will be necessary in series with the relay winding,

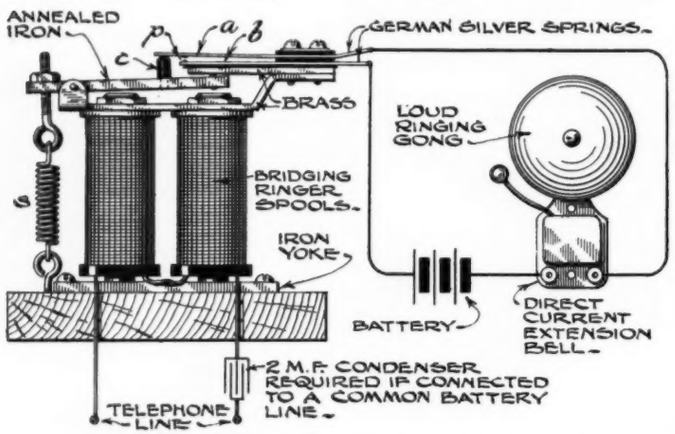


Figure 77—An Extension Bell Alternating Current Relay Made from a Discarded Ringer and Hook Switch Contact Springs.

otherwise the flow of direct current either will operate the relay or cause its armature to stick, as well as allow a waste of the central office current.

Figure 77 illustrates a simple constructed alternating current relay which is particularly adapted to operate the local extension bell circuit just described. The magnet spools of this relay can be taken from a discarded 500 or 1,000 ohm ringer, and the contact springs from a defective hook switch, thus, the only parts to be made are the armature and mounting. The function of these parts is clearly indicated in the drawing so that any convenient construction can be adopted.

The relay is designed to operate on the same principle as that shown in Figure 73, the spiral spring *s* holding the platinum contact *p* normally open. When the armature is drawn up by the magnetic action of the spools, the upper spring *a* is allowed to force its platinum contact against the platinum contact on the stationary spring *b*.

In adjusting this relay a clearance should be left between the hard rubber stop *c* and the spring *a* when the armature is drawn down into its operated position. Also, the normal tension of the spring *a* should be sufficient to make good contact with the spring *b* when the armature is operated. It is hardly necessary to add that while the spring *s* must overcome the tension of the spring *a* it should not be too great a tension, as in that case the relay armature will not operate positively on the average ringing current.

Noiseless Acting Alternating Current Relay.—A very ingenious type of alternating current relay is shown in Figure 78. It was originally designed to meet special requirements imposed by the Bell company's four party selective ringing system. This system makes use of positive and negative pulsating generator currents to selectively operate "biased ringers," two from either side of line to earth, the same as in the elementary polarity party line scheme now used by many Independent and Bell companies.

The relay is employed solely to keep the metallic tele-

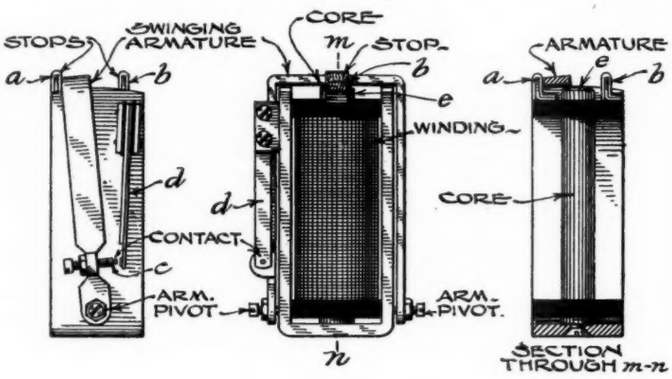


Figure 78—A Quiet Acting Alternating Current Relay for Use in Party Line Telephones.

phone circuit clear from the several earth connections required in this system, except when actually ringing on the line. For common battery purposes the doing away of grounds is a great advantage as otherwise a leakage to earth results from the central battery through the bells.

Figure 79 shows a complete party line circuit with one of these alternating current relays at each telephone. The condensers are used to keep the line circuit normally open as respects the flow of direct current when used on a common battery system.

The operation of ringing on this line circuit is simple when the key connections are studied. For example, the pressing of key No. 1 will connect the negative pulsating generator to the sleeve side of line and a ground circuit to the tip side of line. The negative pulsating current will find paths through all four of the condensers and relays bridged across the line, and a return to the generator

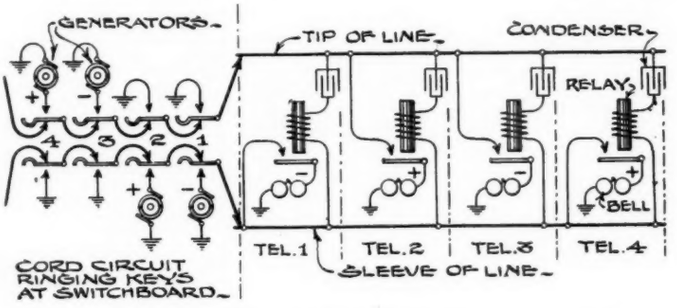


Figure 79—A Polarity Operated Selective Party Line System Using the Alternating Current Relay Shown in Figure 78. This Relay is Used to Keep the Circuit Clear from Earth Connections Excepting When the Operator is Actually Ringing.

through the ground on the tip side of the key No. 1. The alternate charging and discharging of these condensers will produce an alternating current through the circuits containing the relays, thereby energizing the latter and connecting all four bell circuits to ground through the relay contacts. The bell at station No. 1 will be the only one to respond as it is connected to earth from the sleeve side of line, and is biased and adjusted to operate on the negative pulsating current. The other bell on this same side of the line will not operate as its adjustment is for positive pulsating current, also the bells connected to the tip side of line

are practically inoperative due to the low resistance shunt path around the same which is furnished by the ground connection on the tip side of the ringing key.

The other three bells on this party line are operated by the proper keys in a similar manner. In every case, however, all of the four relays on the line are operated simultaneously.

The significance of a special quiet acting alternating relay is now apparent, as any noise in the telephone due to the relay armature will serve as a signal for the curious to listen-in. This noise in the telephone also might indicate to the subscriber that the bell is ringing on defective adjustment and the listening-in therefore justified. In any event, a party line system is not selective if the subscriber is disturbed when the other parties on the same line are signaled, so that when a relay is used its quiet action is imperative.

The relay finally adopted by the Bell company for this service makes use of an armature which is balanced when in its operated position. As will be seen from Figure 78, it has an inverted "U" shaped armature pivoted at the two ends so that the middle portion will rock over the core *c* of the magnet spool. When this armature is in its normal position it is held by gravity against the stop *a*. This stop, as well as that used for preventing the armature from swinging too far on its first movement, is covered with heavy felt, making the action noiseless.

When the armature of this relay is drawn up it closes a contact *c* against a long flexible spring *d* so that any vibration of the former will not affect the positiveness of the contact. Furthermore, the free oscillating swing of the armature over the pole piece does not produce a buzzing noise as is the case when the armature comes into direct contact with the pole piece or frame of a relay.

BOSTON'S INDEPENDENT COMPANY.

The Metropolitan Home Telephone Company, to whom the Boston city council granted a franchise to build an Independent telephone system in that city last fall, held its annual meeting June 10. It is reported in the eastern papers that E. H. Harriman, the railroad magnate, is interested in the new company, and will help to finance the project. At the stockholders' meeting the following directors were elected: Colonel Albert Clarke, Albert L. Ireland, James G. Ferguson, Roger E. Miley, John T. Connor, Bernard M. Wolf and Horace M. Bacon. The directors met and elected the following officers: President, Colonel Albert Clarke; vice-president, Albert L. Ireland; treasurer, James B. Ferguson; secretary, Roger E. Miley.

The officers and directors are prominent men in the business life of Boston. Colonel Clarke, the president, is secretary of the Home Market Club; Albert L. Ireland is president of the William S. Hills Company; James G. Ferguson is president of the J. G. & B. S. Ferguson Company, bakers; Roger E. Miley was for many years, assistant manager of the N. K. Fairbanks Company; John T. Connor is president of the John T. Connor Company; Bernard M. Wolf is proprietor of a large clothing house; Horace Bacon is a member of the firm of W. & A. Bacon.

According to Colonel Clarke the enterprise will have back of it a group of powerful capitalists now largely interested in Independent telephone companies in the west. The interests involved represent New York, Pennsylvania, Ohio, Indiana, Illinois, Missouri, and California. There is said to be a large banking house engaged in advancing the enterprise, but Colonel Clarke is not prepared to name it, or to give exact facts as yet about the ultimate organization and capital stock of the company. He intimated that his own election as president was only temporary, as he would be succeeded later on, when the plans of the company are in more definite shape, by a practical telephone man of large experience.

It is understood that the Boston company has passed under the control of a syndicate of Independent capitalists headed by Max Koehler of St. Louis, and including many of the men interested in Kansas City and Detroit Independent companies. In a recent interview on the subject Mr. Koehler was quoted as saying:

"We intend to organize our new company this fall. Our engineers will complete their work and make their report to me on November 1, and then our company will be organized and capitalized. The purchase of the Metropolitan Home Telephone Company simply means that we purchased the franchise after our attorney reported the franchise was a legal one, and that is about all the company owned in tangible property. We expect to spend nearly $5,000,000 in the construction work alone; $3,250,000 of that will be in building conduits and outside work exclusive of the long-distance lines and over $1,000,000 will be spent for the long distance. We anticipate that it will take us fully one year from next November before we will have our plant in operation, but once it is completed it will be the most complete in every respect of any telephone plant in the world. We will make it even better than the Detroit plant that is now being finished. As to further details, I cannot give them until our company is organized, as they are matters for a board of directors to decide on and not one individual."

Mr. Koehler will sail in July for Europe, where he will spend the summer, and when he returns he will get a complete report from the engineers, and then the work will be put through with all possible speed.

VERMONT-NEW HAMPSHIRE CONVENTION.

The fifth convention of the Vermont-New Hampshire Independent Non-Bell Telephone Association will be held July 9 and 10 at the Hotel Lowe, Bradford, Vt. The program arranged provides for the following papers: "Construction Above and Under Ground," by H. L. Moor, of Barton Landing, Va.; "New Movement of the New England Telephone Company in Vermont and New Hampshire, and its Effect on the Independent Movement," by A. T. Davis, Marshfield, Vt.; "Toll and Long Distance Business," by F. G. Warren, Warren, N. H.; "Growth of the Independents in the Last Year," G. W. Buzzell, St. Johnsburg, Vt.; "The New Law Giving Equal Privileges in Railroad Stations," H. W. Buchanan, Barton Landing; "Co-operative or Stock Companies," C. A. Washburn, Corinth, Vt.; "The Need of Looking After the Independent Telephone Interests in the Legislature," John A. Pickett, Bradford; "Are Two Telephones a Burden to the People?" W. E. Kinsman, Heath, Mass.; "The Past, Present and Future of the Independent Telephone Movement," E. B. Seely, Boston; "What I Know About Telephones," Sam Couch; "The Independent Movement in Maine," F. E. Ebersole, Portland, Me.; "Telephones vs. Allopathy," Dr. O. D. Eastman, Woodsville, N. H.; "The Independent Movement in Massachusetts," C. S. Knowles, Boston; "What Independents are Doing in New Hampshire," W. B. Johnson, Laconia, N. H.

G. W. Buzzell, secretary of the association, has made laudable efforts to insure a large attendance and it is anticipated the convention will prove to be a representative gathering.

The longest distance the human voice has been transmitted is believed to be from Montreal to Winnipeg, 1430 miles, over a special copper wire along the lines of the Canadian Pacific Railroad. The wire, which has intermediate connections only at North Bay and Fort William, was installed by the railroad company for its telegraphone system, by means of which two messages, one by telephone and the other by telegraph, can be transmitted simultaneously over the wire.

DECISIONS AFFECTING TELEPHONY

By Gilbert W. Hand

VILLAGE STREETS LIKE RURAL HIGHWAYS.

READERS of TELEPHONY will recall the former discussions in this department of the distinction made by the New York courts between city streets and rural highways with reference to the right of companies to place poles without the consent of the owner of the fee in the streets or highways. It will also be recalled that the rule was declared in Eels v. American Telephone & Telegraph Company, 143 N. Y. 133, 38 N. E. 202, that a company need not acquire the privilege from the owner of the fee in city streets, but that if such company is to place poles along rural highways that the authority must first be obtained from the property owner before the company may lawfully erect poles. In a recent case the New York supreme court, appellate division, second department, has had occasion to find it necessary to draw the line with reference to villages and to class the streets in them either as city streets or as country roads. The facts were that the State Line Telephone Company had erected certain poles on one of the streets of the village of Peekskill, a town of about 1,000 inhabitants. The owner of the abutting land on a portion of Smith street objected to the poles being in front of his property and ordered the telephone company to take them down. On refusal ejectment was brought against the company. The latter held a franchise at the time permitting operation in the village. The above court quoted the following from the Eels case above referred to: "We think neither the state nor its corporation can appropriate any portion of the public highway permanently to its own special, continuous and exclusive use by setting poles therein, although the purpose to which they are to be applied is to string wires thereon and thus transmit messages for all the public at a reasonable compensation. It may be at once admitted that the purpose is a public one, although for the private gain of a corporation; but the constitution provides that private property shall not be taken for public use without compensation to the owner. Where land is dedicated or taken for a public highway, the question is, What are the uses implied in such dedication or taking? Primarily there can be no doubt that the use is for passage over the highway. The title to the fee of the highway generally remains in the adjoining owner, and he retains the ownership of the land, subject only to the public easement. If this easement do not include the right of a telegraph company to permanently appropriate any portion of the highway, however small it may be, to its own special, continuous, and exclusive use, then the defendant has no defense to the plaintiff's (property owner's) claim. Although the purpose of a public highway is for the passage of the public, it may be conceded that the land forming such highway was not taken for the purpose of enabling the public to pass over it only in the then known vehicles, or for using it in the then known methods for the conveyance of property or the transmission of intelligence. Still the primary law of the highway is motion, and whatever vehicles are used, or whatever method of transmission of intelligence is adopted, the vehicle must move and the intelligence must be transmitted by some moving body, which must pass along the highway, either on or over or, perhaps, under it; but it cannot permanently appropriate any part of it." The court then went on to apply the above reasoning to the case of village streets and said: "Our attention has not been called to any case holding that the respective rights of the owner of the fee in a village street and a telephone company are controlled by the mere fact that the street is within the corporate limits of a village. While it has been held (Eels case) that there may be a difference between the extent of the public easement in a country highway and in a village street, dependent upon the actual necessities of the inhabitants of the latter for sewers, gas, water, and other conveniences, the court has recognized that the question depends largely upon density of population creating such necessity, and that the necessity for the dedication of a city street for such greater easement may be implied. It does not go to the extent, however, of divesting the owner in fee of a village street of any of the rights belonging to him in a country highway, simply because the one is within and the other is without the corporate limits. . . . We believe that the rule applicable to a village of one thousand inhabitants ought to be the same as that in purely rural districts." From the foregoing reasoning it seems to be a question of fact in each special instance whether the owner of the fee may compel the company seeking to pass in front of his property to condemn and acquire the right in this manner. Between a rural district and the crowded streets of a city are many degrees of density of population and when the line of division is passed from one class to the other is purely a question of fact for the decision of a jury. No doubt either extreme would leave the matter a question for the court, but as in the case discussed when attention is given those localities which are neither cities nor rural communities, a more difficult question can easily be presented. The safest way, evidently, for companies erecting poles in the middle class of communities will be to secure the right from the abutting owners and thus avoid the occasion for a lawsuit.

Powers v. State Line Telephone Company, 102 N. Y. S. 34.

NEGLIGENCE TO PLACE WIRES LESS THAN THE STATUTORY DISTANCE FROM THE GROUND.

Section 1778 of the laws of 1898 of Wisconsin, as amended, provides for the construction of telephone lines on highways and makes it the duty of such companies to place their wires not less than twenty-four feet above the ground at points of crossing of roads and at such places as they might interfere with the use of the highways beneath and fourteen feet from the ground at all other places. One Chant was driving a threshing separator along a certain road with the elevator up, the top of which was thirteen and one-half feet from the ground. A guy wire of the Clinton Telephone Company was so placed that it was only thirteen feet from the ground and as the separator passed along it caught on the wire and received certain damage. The driver of the machine testified that he did not notice the guy wire as he passed under it. On these facts the supreme court has held that the company was liable for the damage done the machine.

Chant v. Clinton Telephone Company, 110 N. W. 423.

ASSESSMENT OF TELEPHONE PROPERTIES IN KENTUCKY.

The Kentucky statutes of 1903, sections 4077-4081, provide that certain corporations, including telephone companies, shall, in addition to other taxes, annually pay a tax on their franchises to the state and a local tax thereon to the county, incorporated city, town, and taxing district where the franchises may be exercised; each corporation shall report the amount of tangible property in the state

and where situated and assessed and the fair cash value thereof. It is further provided that a board of valuation and assessment is to fix the value of the capital stock of each corporation, and from such amount deduct the assessed value of all tangible property assessed in the state, the remainder to be the value of its corporate franchise subject to taxation in each county, incorporated city, town or district through which the lines of the company pass. Section 4020 of the Kentucky statutes provides that all property of domestic corporations, including intangible property, considered in determining the value of franchises, shall be subject to taxation, unless exempt by the constitution, and shall be assessed at its cash value. In a recent case it has been held in a question involving these statutes that the bonds, notes, accounts, cash, stock in other corporations and other credits of a telephone corporation are intangible property, and are not subject to assessment by the local assessor, but are to be considered by the board of valuation in fixing the franchise tax.

Commonwealth v. Cumberland Telephone & Telegraph Company, 99 S. W. 604.

RELEVANCY OF CONVERSATION OVER TELEPHONE TO BIND A DEFENDANT IN A CRIMINAL CASE.

One of the first cases that the writer has noticed where a conversation over a telephone has been used as evidence against a person accused of crime has recently been decided in the Iowa courts. The defendant was at one Spicer's, where the former talked with witness Gibney at some other telephone station. Gibney testified: "I talked to Usher (defendant) over the telephone at Spicer's." He was then asked: "You may state what, if anything, defendant said to you, and what he answered." The answer was: "To the best of my knowledge I supposed it was Usher." This was strongly objected to on the ground that there had been no identification of Usher and that the defendant in any event could not be bound by a statement made over the telephone. The court in discussing the matter said: "The same objection was repeated several times and overruled, and the witness testified that, among other things, they discussed the propriety of calling the township trustees. The court's rulings are vigorously assailed on the theory that the defendant was not identified as the person at the other end of the line. The testimony of the witness that the talk was with Usher involved an identification of him *by the sound of his voice.* This was confirmed by his subsequent testimony that in his best judgment the person with whom he talked was Usher. . . . We think the identification sufficient at least to carry the question as to identity to the jury." This decision is in harmony with the general rule that in telephone conversations the identity of the person at the other end of the line is fairly established when the witness testifies that he knew with whom he was conversing by the sound of the other's voice; at least a question of fact is then presented for the jury to pass upon.

State v. Usher, 111 N. W. 811.

COMPANY MUST NOT REQUIRE ONE SUBSCRIBER TO GO TO CENTRAL OFFICE AND PAY IN ADVANCE UNLESS ALL DO SO.

A statute of Arkansas, Acts 1885, page 178, provides that: "Every telephone company doing business within this state and engaged in a general telephone business shall supply all applicants for telephone connections and facilities without discrimination or partiality, provided such applicants comply, or offer to comply, with the reasonable regulations of the company, and no such company shall impose any condition, or restriction upon any such applicant that is not imposed impartially on all persons, or companies, in like situations—under penalty of $100 for each day such company continues such discrimination." One J. C. Yancey, a subscriber of the Batesville Telephone Company and the Southwestern Telegraph & Telephone Company, which companies operate their exchanges together, brought suit under the above statute alleging that he had been denied long-distance telephone connection from his residence or place of business until he had first gone to the central office of the companies and paid cash in advance, and alleged that this action on the part of the companies had continued for nearly a year. He further alleged that other subscribers were allowed connection without this requirement and claimed that such action on the part of the companies was wilful discrimination against him for which he was entitled to the penalty provided by law which he fixed at $100 for 365 days or $36,500 in all. The companies denied that such action was discrimination and in the lower court the companies' contention was sustained, but the supreme court of the state has taken the opposite view, saying: "The requirement that appellant (Yancey) should first go to the central office of the exchange and pay cash in advance for such telephone messages, service and communication, when it was not required of other subscribers, was an unreasonable and unnecessary discrimination, and is forbidden by the statute. The payment of the charge is all that should concern them in that connection. All else is arbitrary and unnecessary." The case was accordingly sent back for a new trial.

Yancey v. Batesville Telephone Company et al., 99 S. W. 679.

BOURSEUL BEFORE BELL.

Some days ago there died in a little village near Paris, France, a man who is now proved to have been the original inventor of the telephone, says the Telephone World. His name was Bourseul and he had been for many years a humble functionary in the postal department of France, having but recently retired on a small pension. Finding it impossible to live on this slender sum he called one day on M. Mougeot, minister of posts and telegraphs, sending in his card as "M. Bourseul, inventor of the telephone." M. Mougeot thought he must be a harmless lunatic and allowed him to enter. An hour afterward he ordered a rigorous examination into Bourseul's story, which he found to be entirely correct.

The postoffice archives proved that in 1854, after vainly trying to convince the French postal authorities that he had discovered a new application of electricity, he had published in various technical periodicals an account of his invention.

Among his directions for the construction of a telephone at this time was the following:

"Suppose that a man speaks near a movable disk sufficiently flexible to lose none of the vibrations of the voice, and that this disk alternately makes and breaks the current from a battery; you may have at a distance another disk which will simultaneously execute the same vibrations."

Later Philip Reis, a German schoolmaster, invented an instrument following these directions which in the light of present knowledge could talk and the claim is made by Reis' friends that it did talk.

On learning the truth of the old man's story M. Mougeot sent for him and after a warm greeting asked what he wanted from the government. Bourseul said he could live on his pension if it were increased by another $600 a year, a tremendous increase from the French standpoint. The aged inventor was overcome with joy and retiring to his village lived a few years more in perfect content, feeling that he had come into his own. There is some talk of raising a monument in Paris to his memory.

Another telephone operator has captured a rich husband. Alice G. Medin, an operator at Butte, Mont., was recently married to William A. Clark, the youngest son of the copper king, one of the wealthiest men in the world.

GENERATOR CALL LAMP SUPERVISORY SYSTEMS

A Discussion of Plans for Applying a Lamp Disconnect Service to Local Battery Generator Call Switchboards

By H. P. Clausen

IN these days of lamp signal common battery switchboards the great advantages of automatic signaling and supervision of subscribers' connections are thoroughly appreciated by every one having anything to do with the operating of telephone exchanges. Many of the operating companies, however, still have a comparatively first class equipment of local battery telephones and switchboards, and whenever any plan is proposed which will permit of obtaining only a portion of the advantages of a common battery switchboard, such plans are always given serious consideration.

In most switchboards of the local battery—or what we shall term hereafter magneto call type—it is out of the question to consider re-equiping the line circuits so that a signal is operated at the switchboard when the subscriber removes his receiver from the hook switch. This operation, however, is not the most important one. It is the automatic disconnect service which is of the greatest benefit and which, therefore, receives the most consideration when study is given to the subject of converting a magneto call switchboard into a lamp signal system.

It is not a very serious objection to the operation of an exchange when the subscriber is required to drive his mag-

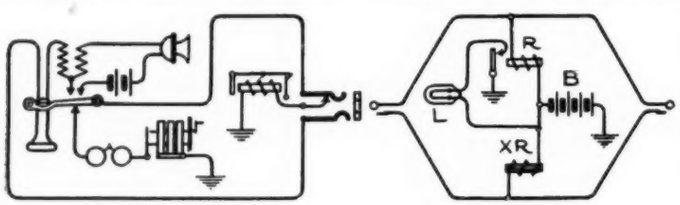


Figure 1—An Addition Apparatus in Telephone.

neto generator when calling central, but it is entirely out of the question to expect the subscriber to give the crank of his telephone generator a few extra turns when he has completed a conversation. This failure on the subscriber's part to ring off is, of course, a great source of trouble to the exchange manager, for he is required to train his operators carefully to supervise the connection from start to finish, for fear that the connection may not be taken down promptly, and should one of the connected subscribers call central after the conversation has been completed and before the operator has taken down the connection, then the calling subscriber's signal not only operates the clearing-out drop but also actuates the bell of the telephone belonging to the subscriber with whom he has just held a conversation.

It is, therefore, the writer's object to discuss this question of lamp disconnect as applied to magneto call switchboard without touching on the question of automatically calling the central office, as such provisions will always entail complications, and the expense of converting a switchboard into automatic calling and disconnect service is very considerable, whereas the expense of installing automatic disconnects alone is not at all out of reach of even the smaller exchanges.

One of the first plans which suggests itself to the circuit designer attacking the problem of a lamp disconnect would be to connect the signal bell at the subscriber's telephone to earth and ground one side of the drop at the switchboard, so that in order to call central it is only necessary to drive the magneto generator at the substation, thus ringing in grounded. The remaining line wire standing idle until the receiver is removed from the hook switch, in which case the ground is removed at the subscriber's station. Upon

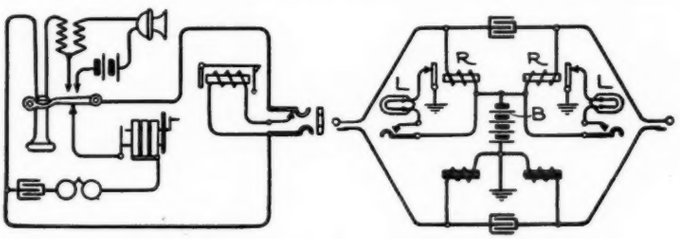


Figure 2—Condenser in Ringing Circuit of Telephone.

the operator placing a switching plug into the line jack, the line drop is disconnected in the usual manner, and the connection may be extended through to the called for subscriber's line. Upon placing the calling plug into an idle line circuit it will be observed that current passes from the battery *B* through the winding *R* over the tip side of the line circuit through the subscriber's station signal bell to ground, and from there back to the battery *B*. This obviously results in drawing up the relay *R* and causing the supervisory lamp *L* to burn, but when the subscriber responds, he removes the ground from the tip side of the line and the supervisory signal is restored. The extra winding, *XR*, of the relay may be in the form of an impedance coil, or simply the second winding on the relay spool. It performs no other function than to keep the circuit balanced electrically, and is a guard against cross talk.

Figure 1, however, has the objectionable feature that when party lines are operated it is necessary to loop the different stations so that any party removing the receiver from the hook switch may operate the signal. Further, it has the disadvantage of using the ground return. This

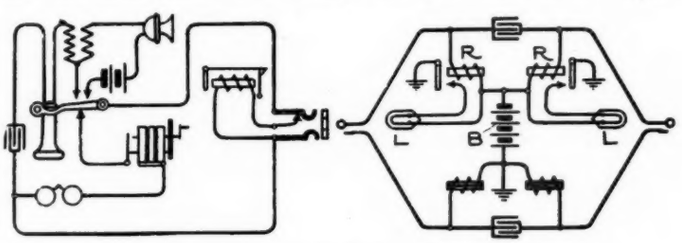


Figure 3—Condenser in Talking Circuit of Telephone.

plan produces noise while subscribers are waiting for the central office to respond, or while waiting for a called for party to answer the signal. This plan, therefore, while it may be adopted and operated with considerable satisfaction, is not to be recommended.

Figure 2 shows a method which may be adopted, although it is not the best form of a circuit. It will be ob-

served that the subscriber's telephone has been equipped with a condenser in series with the ringing circuit. The central office is called regular by simply driving a magneto generator. The cord circuit is arranged with a double wound relay provided with a back contact and connected to a supervisory lamp. In addition to the relay and the supervisory lamp, we have a plug socket switch, and, while by

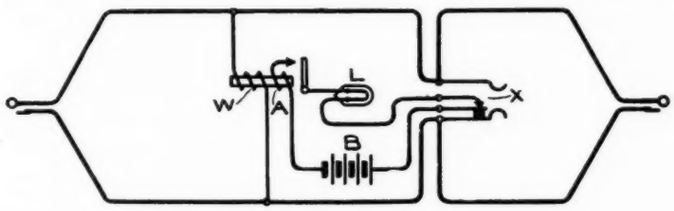


Figure 4—Old Style Lock-up Relay Circuit.

some people, the plan will be immediately condemned owing to the use of a plug socket switch, it is not the purpose of this article to discuss the different satisfactory or unsatisfactory types of plug switches. The fact remains that it may be installed, and when it is as shown by Figure 2, the operation is as follows:

The subscriber transmits a call to central, and upon the operator answering, the supervisory relay is energized, causing a flow of current through the subscriber's telephone receiver and necessitating, therefore, that the receiver be poled, i. e., so connected to the line circuit that battery which flows from the central office over the line, augments the permanent magnetism of the telephone receiver instead of reducing it, which would be the case if a reverse current were sent over the line. Upon the operator plugging into a line circuit for the purpose of calling a subscriber, the presence of the condenser in the ringing circuit will prevent any actuation of the relay in the cord circuit. Therefore, the supervisory lamp burns until the subscriber responds. Obviously, the presence of the plug socket switch is called for through the fact that whenever a plug is removed from its socket, the supervisory lamp L must burn unless the relay R is energized, in which case the lamp is extinguished.

Referring to Figure 3 a means is provided through which

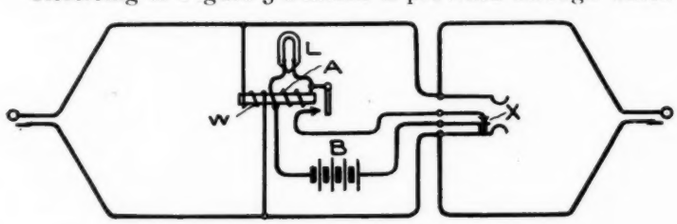


Figure 5—Improved Type of Lock-up Relay Circuit.

the socket switch may be eliminated from the circuit, as follows:

Instead of inserting a condenser in the ringing circuit, it may be inserted in the subscriber's telephone circuit, and when this is done, the operator plugging into the line jack in answering a call finds that the supervisory lamp L does not burn owing to the fact that the condenser in the subscriber's telephone circuit prevents a flow of battery current, and therefore the relay R is not energized. When a subscriber replaces the receiver to the hook switch, however, then there is an immediate flow of battery from battery B through the relay R and over the line circuit through the signal bell at the telephone. This plan, then, while it utilizes a condenser in the subscriber's station, does not call for a plug socket switch.

Figure 4 shows a plan which has seen quite a little service, particularly in toll boards. This cord circuit relay, it will be observed, consists of a winding W connected directly across the cord circuit, while the winding A is placed on the same core of the relay upon which the winding W is wound. The supervisory lamp L is connected to the armature of the relay and also to an extra spring on the listening key belonging to the cord circuit. The operation is as follows: When a subscriber rings off, the winding W magnetizes the core of the relay and draws up the armature which then closes the circuit, which includes the A winding of the relay, the battery B and lamp L. This locks the relay in position, and we have the lamp signal. This, it will be observed, does not take care of any automatic disconnect means. It is simply a lamp signal disconnect.

Figure 5 shows a modification of the circuit shown by Figure 4 and covers an arrangement through which the battery B feeds current to the lamp L and auxiliary winding A in multiple. That is, the lamp is connected in multiple with the A winding and the auxiliary winding may therefore be made of a comparatively high resistance, whereas, with a circuit shown by Figure 4, the winding A must be sufficiently low for passing enough current to light the lamp L. Both of these plans contemplate that when the

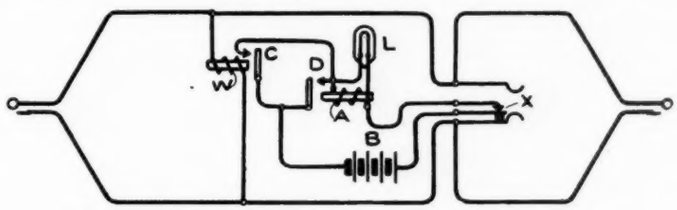


Figure 6—Most Improved Type of Lock-up Relay Disconnect.

operator receives a disconnect signal and listens in that the contact at X opens, in which case the auxiliary winding loses its current and therefore the relay releases its armature.

A difficulty with this circuit is that when a sufficiently strong current is projected through the winding W, a reverse polarity is likely to "kick off" the armature of the relay and no disconnect signal will be produced. When the winding A is made sufficiently powerful to prevent this "kick off" action, then with a low voltage lamp at L it sometimes happens that the induced current from the winding W causes an abnormal flow of current through the winding A frequently of sufficient voltage for burning out the lamp L.

In order to overcome this objection the plan shown in Figure 6 may be adopted. In this circuit the relay winding W closes a normally open contact at C which causes the relay A to draw up its armature, closing its normally open contact D and through locking up the circuit, causes the lamp A to burn until the operator listening in on the circuit and through opening the contact X, de-energizes the relay, thus restoring all parts to normal.

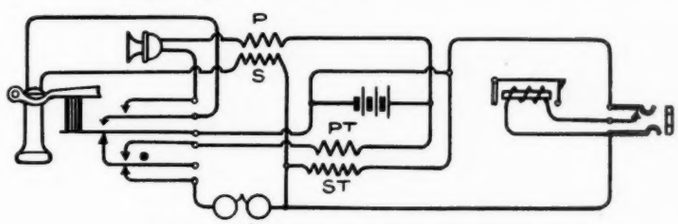


Figure 7—"Kick" Coil Telephone Circuit.

Figure 7 shows an arrangement which may be applied with some success, namely: Without any changes in the cord or line circuit of a switchboard, the telephone may be of a type which automatically signals the central either for the initiation of a call or disconnect service. The telephone used in this case must be made for that purpose. In other words, it is known as "kick coil telephone" and consists of an arrangement in which a set of passing con-

tacts in the hook switch of the telephone momentarily connects the transmitter battery to the primary of a transformer. The secondary of the transformer being connected to the line circuit, it is obvious that with a sufficiently powerful secondary kick it will be possible to throw the central office drop whether it be the line signal or clearing-out drop, for when the receiver is removed from the hook switch, the contact is made and a momentary current passes through the primary of the transformer, inducing a secondary current in the remaining winding and energizing the line signal at the central office. Upon replacing the receiver to the hook switch the same connections are made, resulting in projecting another impulse of current over the line wires and operating the clearing-out signal.

Having given this subject of lamp disconnect brief consideration, it may be well to sum up the problem in general. The circuit shown by Figure 1, while it may be adopted, will not prove very satisfactory for large exchange equipments. It will serve well enough for small exchanges and where no great trouble may be expected from street railway or electric light circuits, for the inductive disturbances would be considerable in a plan shown by Figure 1.

Figure 2 calls for the installation of a condenser in the subscriber's telephone circuit. This, of course, is expensive. And, further, the condenser must be of sufficiently high capacity for permitting the central office signals being energized through the condenser from current generated by the average series telephone generator when driven at an ordinary speed.

Figure 2 also possesses the disadvantage of projecting a battery current over the line wires and through the subscriber's telephone. The telephone receiver must be properly connected to the line, and, when this is not done, unsatisfactory service is had. Further, the continued flow of current over the line wires and through the telephone and cord relays means that the battery equipment must be of considerable capacity. We have, further, the disadvantage of a plug socket switch, which is a necessary evil in this system. We also have a normally resting contact in the supervisory relay. This is not entirely satisfactory.

Going now to Figure 3, we find the condenser in the subscriber's station equipment may be of very low capacity, where with Figure 2 the condenser should be at least 2 m.f., a ½ m.f. condenser will serve equally well in the circuit shown by Figure 3.

It is found that we have eliminated the large battery requirement, for while the subscribers are talking, no current is passing over the circuit and when the receiver has been replaced to the hook switch, it is merely a matter of quick operating to stop the flow of battery over the line, for then the lamp is burning. We have further eliminated the resting contact from the supervisory relay and also the plug socket switch. This plan, it is thought, should be given a most careful consideration when studying the question of installing a lamp supervisory system in the cord circuit. The addition of a condenser at the substation is a simple operation and the converting of the cord circuit simply calls for two condensers, two double wound front contact relays and the supervisory lamps. The battery equipment can be of a comparatively small capacity, depending, of course, somewhat on the size of the exchange, for we must remember that the battery must have a fairly low internal resistance, as cross talk might otherwise be the result.

Figure 4 is a plan which the writer does not think can be adopted with any success for a magneto exchange. At least, not for local service. For toll service the plan may be used and is used with considerable success. Figure 5 shows a plan which operates under the same conditions as Figure 4, excepting that we have eliminated the defects which always are present when an attempt is made to operate a supervisory lamp in series with the winding of a relay.

Figure 6 is also used for toll work and overcomes the objections of Figure 4 due to lighting a lamp in series with the windings of a relay; it also overcomes the objections of Figure 5 where the supervisory lamp is likely to be damaged through an induced current from the winding *W*, for in Figure 6 the circuit arrangement shows the supervisory lamp and auxiliary relay entirely separate from the windings connected across the cord circuit.

The plan shown by Figure 7, the writer believes, has not been as thoroughly worked out as it may be. In the first place, it requires a special telephone which is of no use for anything but a local service. Further, it is difficult to maintain the batteries of the telephone in the best possible condition for transmission of speech or signals. The battery subjected, as it is, to a considerable drain of current, rapidly becomes exhausted, and if the battery is not in proper condition, the signal service is interfered with, which means that the central office cannot be reached, not to mention the failure of the clearing out service.

It should further be remembered that even though the subscriber is able to signal the central office for the initiation of a call, he may complete the conversation, but when this conversation is of considerable length, obviously the strength of the battery is reduced and the result is that the subscriber cannot signal the central for either a connection or initiation of a call until the battery recuperates.

In connection with Figures 2 and 3 it should be mentioned that when more than one telephone is connected to the line wire, then Figure 3 calls for a looping through of the hook switch contacts so that the line may be opened whenever a receiver is removed from the hook switch. Otherwise, the supervision would not be accomplished.

Finally, therefore, when operating party lines, Figure 2 is the best plan to adopt, but where all lines are equipped with a single telephone Figure 3 undoubtedly presents the best arrangement.

FOREST SERVICE TIMBER TESTS.

Extensive tests to determine the strength of the commercial timbers of the United States are being made by the government forest service. Such information is of great value to architects and engineers in that it enables them to use more economically the products of the forest. The tests are made on large beams. The material is generally tested while green, since timber is weakest in the green condition. The strength of a beam is indicated by the greatest fiber stress developed during the test. Technically speaking, this breaking strength is termed the modulus of rupture. By using it the load that any beam will carry may be calculated. In the table below the first column gives the green breaking strength of our principal commercial timbers. The second columns gives the greatest load that a timber 5 inches wide and 12 inches high, with 15 feet between the supports, would hold if the load were concentrated midway between the supports.

Species.	Breaking strength in bending lbs. per sq. in.	Breaking load concentrated midway between supports, for a beam 5″x12″x15′ lbs.
Longleaf pine	7,772	20,700
Douglas fir	7,500	20,000
Western hemlock	5,783	15,400
Loblolly pine	5,580	14,900
Tamarack	4,562	12,300
Norway pine	3,975	10,600

If instead of being concentrated at one point, the load were uniformly distributed over the entire length of the beam, the beam would hold twice as much. In order to insure safety, in practice beams are seldom allowed to carry more than one-sixth of their breaking loads.

EXPERIMENTS IN WIRELESS TELEPHONY

An Abstract from the Elektrotechnische Zeitschrift as Published in the London Electrician

By Ernest Ruhmer

THE author, referring to Poulsen's successful production on a commercial scale of high-frequency undamped electrical oscillations, expresses his opinion that wireless telephony has entered upon a new epoch of development. Of course for several years past the utility of undamped waves, if they could be obtained, has been clear, for the waves need only have the speech modulations stamped upon them in some way that can be read in the

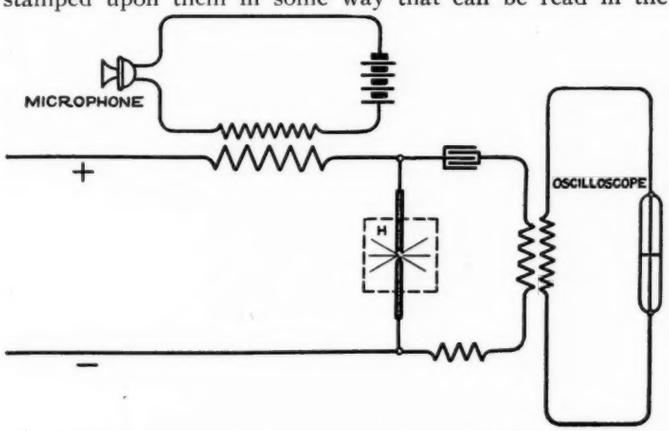


Figure 1—Connections of Microphone and Oscilloscope.

telephone at the distant receiver, and the problem is solved.

Taking the sender as consisting of a closed oscillation circuit round which the undamped oscillations flow, coupled with an open radiative circuit tuned to it, then two distinct methods can be proposed of influencing the electric waves by speech. The one method is to cause speech to alter the strength of the oscillations without changing the period; the second is to cause alteration of the period, either of the open or of the closed circuit, without altering the strength of the oscillations. In the first case the sensitive detector at the receiver would, if in series with a telephone

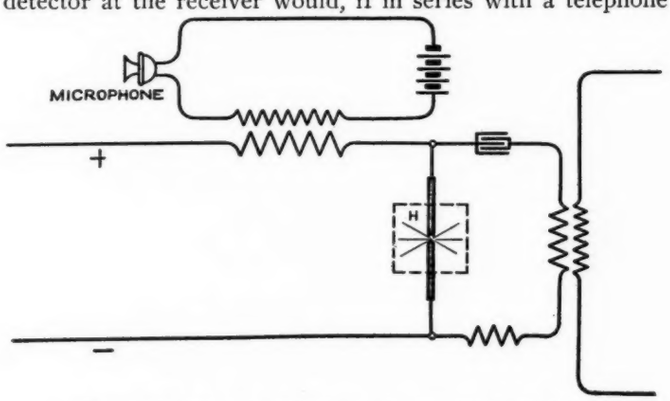


Figure 2—Wireless Telephone Transmitting Station.

and cell, perceive and record the variations in strength of the continuous train of waves. In the second case, since with varying wave-length the number of waves received in the same time varies, the telephone effect would depend on the period of the received waves.

In the author's experiments a singing arc in hydrogen (continuous current 220 volts) had its shunt circuit formed of seven Leyden jars of about 0.02 m. f. total capacity, and a self-induction coil which formed the primary of a small Tesla transformer. By suitable tuning a quietly burning high-tension flame arc several centimeters long could be maintained between the terminals of the Tesla secondary. Usually instead of the flame arc, an oscilloscope vacuum tube, *O*, in Figure 1, was used, with advantages to the tuning.

In order to affect the arc, and therefore the waves emitted, by speech sounds, advantage was taken of the choking coil, which is usually placed between the arc and the continuous-current mains terminals to stop the oscillations leaking into the mains. This choking coil was, in fact, made the secondary winding of a transformer whose primary coil was in series with a microphone and battery. By means of a rotating mirror the glow of the vacuum tube was examined while the microphone was spoken to. It was found that speaking into the microphone affected the strength of the oscillations in the oscillation circuit, just as desired. Very probably, in this disposition of apparatus, the effects were due to a combination of both the processes—

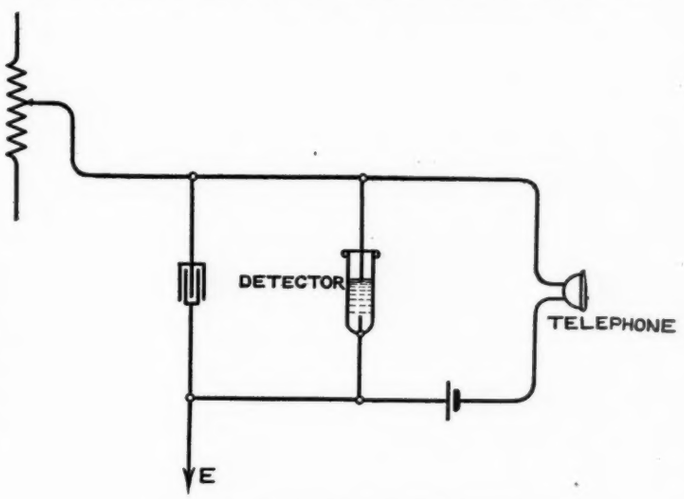


Figure 3—Wireless Telephone Receiver.

alteration of strength and alteration of period of the oscillations—mentioned above. When the high-tension flame arc was used instead of the oscilloscope tube this arc emitted loudly and distinctly the words spoken into the microphone.

The next step was to replace the Tesla circuit by an open radiating circuit, Figure 2, and to erect a receiver, Figure 3. The electrolytic detector proved to be better than a loose contact detector. It was found that with an air-wire 1.5 meters long speech could be transmitted loudly and distinctly a distance of more than thirty meters. The author concludes by registering his opinion that a transmission over several kilometers should soon be possible.

An Evanston (Illinois) man has originated the idea of giving his cow a telephone number. William French of that city has a fine Jersey which was prone to stray from home. With bright red paint he branded his cow "Tel. 46." and now when she is picked up far from the owner's farm the finder can communicate with Mr. French and advise him where his wandering "bossy" can be located. Other Evanstonians have adopted the same plan.

INTERNATIONAL CONVENTION PAPERS

Some Interesting Addresses Made at the Chicago Meeting in June.

INDEPENDENT IMPROVEMENTS AND POSSIBILITIES.

YOUR committee assigned me this subject and then said "Be brief." I wonder if they realized that long distance service started in Noah's time and has possibilities to the blowing of Gabriel's horn? Noah seems to have been the original traffic manager, and I think sent and received a reply to the first long distance message on record. Twice he had to say to his subscribers, "No circuit," but finally the line was clear, the message sent, and the answer brought good tidings of dry land, sunny days and a promise of that development of the human race which has continued to the present time, and which we trust will continue for centuries to come. From then until quite recently long distance development was slow and unsatisfactory, but the last ten years has shown a growth so rapid that it is astounding; what the next ten years will bring forth no one dares to prophesy.

The lessons of the past are many; from them let us build for the future with each day's work as part of such a complete and substantial structure that when finished future generations can say of us that we, too, did our share towards this development and progress which is going on and will continue to go on from year to year and from century to century.

All great movements, social, political or commercial, have in them certain elements of combined strength and weakness; and so it is with the Independent telephone movement. Its strength and its weakness lie in the fact that it represents so many and such diversified interests. Coming as we do from every state in the union, with stockholders living in every county and almost every city and town in these states, we represent people of all classes, rich and poor, farmer and artisan, banker and clerk, and come nearer representing the entire people than any other convention held in this broad land of ours, with the exception, possibly, of the conventions of our great political parties. This is our strength. Each company managed by its local board of directors through its secretary, general manager, general superintendent or whatever you may wish to call him, has ideas of his own, some good, some bad, some indifferent; but always in close touch with local people, knowing their habits, their needs, their conditions, we are better able to give satisfactory local exchange and "short haul" long distance service than companies managed and owned by directors and stockholders hundreds of miles away.

Long distance service, however, under this kind of management is not satisfactory. If Johnson in Illinois wishes to talk with Jones in Ohio or Morgan in Missouri he must, to get good results, talk over lines operated under the same schedule of rates, the same time limits for conversation, the same code between operators, and in general terms built of the same class of construction and with about the same apparatus; and the companies handling his business must be assured that when his message is completed they will each get their share of the "haul."

Here is where we are weak: One company believes in a three minute time limit, another in five. One says one-half cent a mile is enough, another three-fifths. This company's lines are of copper, that one's mostly iron. This company uses a code designed by its own traffic manager, that one the code of its state association, and the next one no code at all, and so on. What is the result? Confusion, bad service and dissatisfied subscribers.

Travel follows the best highways, electricity the path of least resistance, telephone traffic the lines of best service and most reasonable rates. To hold our own we must "get busy."

We cannot expect to hold the business of the large manufacturer who wishes to talk with Pittsburgh, Cleveland, St. Louis, Kansas City, Minneapolis, Dayton or Oshkosh unless we can give prompt and satisfactory service. If he uses our competitor's lines for the "long haul" he is likely to do the same for the "short haul." Mind you, I do not claim that this, what might be called "long haul" long distance service, is the most valuable or necessary part of our business; it is not by any means; but at the present time it is what we lack the most in the way of giving complete service to our subscribers, and is one of our competitor's strongest points in holding important commercial institutions that would otherwise like to dispense with their telephones.

"Short haul" long distance messages are, and I believe always will be, a most important factor in the building up of our business and earning profits for our stockholders.

Ninety per cent at least of so called long distance messages go to points within fifty miles of the originating station. There seems to be no limit to business of this character, except probably the limit to the number of circuits. Time and again I have seen new circuits built for the purpose of relieving congested lines, and the result is simply enough more business to make the new line as busy as the old one. Of course there is a limit to this, but few of us have reached it. In communities where there are enough circuits to take care of the 10 cent and 15 cent messages as fast as they are sent in it will be found that the telephone has practically superseded the mail as a medium for carrying on of business. The merchant, the manufacturer, the produce dealer, cannot waste his time and the time of his clerks or stenographers writing letters and waiting for replies when for 10 cents or 15 cents and but little more time consumed than in getting a local subscriber he can get in touch with the party wanted from ten to twenty-five miles away.

Build more lines of this kind. Copper is high, we all realize that, but with pole leads already up new lines can be built at a comparatively low cost, and the investment will bring in surprisnig returns.

The telephone habit, fed with the proper food, grows and flourishes like a young bay tree. Watch your subscribers' toll bills from month to month, and get after those showing a falling off or only slow gains. Possibly one or two messages to points where service is unsatisfactory have caused your subscriber to condemn your entire system, and a little education will do him worlds of good, and in nine cases out of ten will bring him back to the use of your lines and increase his use of them wonderfully.

Trunk lines between the large commercial centers should be built at once; this matter is so essential to the success of the Independent movement that every effort should be made towards development along these lines without any further delay. A careful study of the map of the United States will show that the territory east of Kansas City almost to the Atlantic ocean is so filled with Independent exchanges and long distance lines that it is not going to be much of a problem to fill in the necessary gaps and make a long distance system so complete and comprehensive as to be astounding. When this is done our competitors are going to have a hard time stirring up trouble like they threatened in Indiana a short time ago.

You will find that in nine cases out of ten the Bell company induces local exchange companies either to connect with its lines or to become sub-licensees because the local company does not have enough long distance lines to take care of the business properly, and they think when they connect with the Bell their troubles will be over, but the awakening is generally a sad one. They find that, while they are able possibly to talk with points five or six hundred miles away better than they were over the Independent lines, that to points in their own state, they are more often worse off than they were before. I will venture to say that in the states of Michigan, Indiana and Ohio, and I presume in most of the other states, that service to points where from ninety to ninety-five per cent of the business is done can be secured with more satisfaction over the lines of the Independent companies than over the Bell; and yet their strongest talking point is what they call their "superior long distance service." Why? Because, as stated before, they undoubtedly beat us out giving service to points five or six hundred miles away, and while only a few of the subscribers to any exchange talk with these far-away points it still makes a drawing card and they use it for all it is worth.

Before any larger development can be made, however, traffic associations and clearing houses must be thoroughly organized. Neither companies nor individuals will put their money into lines unless they have positive assurance that they will have their share of the "haul" for all business going over them. This seems such a reasonable and sane proposition that it is almost absurd to make the statement; and yet the lack of appreciation of it is holding back Independent long distance development more than any other factor. As a general proposition each state should have its own traffic association and through the clearing house of this association all business inside the state should be handled. This state association should then be affiliated through its officers with the traffic associations of neighboring states with which it does most of its business, and these interstate associations should then through their officers again form a national traffic association.

Operating rules, codes, time limits, rates (outside of those purely local in each state) and all methods of handling long distance business, etc., etc., would be handled through these associations, and we would then have an organization stronger by far than if we were all in one large company, and still retain the strength that comes with local organizations, local directors and local stockholders.

An army is made up of units, but these units must have a head and must maneuver, fight and advance under some well defined rules and tactics. We have the units, we are fighting for a principle, we have won the skirmishes and battles. It is a campaign that we are fighting now, and it calls for organization, thorough and complete. Many of the states are already in line, and others are

getting ready. Do it now, and in a short time Independent long distance service will mean "long distance" in every sense of the word.—*A Paper read by C. E. Tarte before the International Convention.*

WHERE THE COPPER COMES FROM—MONTANA.

In the extent and magnitude of her mineral resources Montana stands preeminent and alone without a peer. First in value and importance of her mineral products is copper, for Montana is truly the state where the copper comes from, and while your finance committee are preparing the budget to take care of the extensions of your lines or improvements of your great telephone plants, and wondering how much advance they will have to pay for the next car of copper wire, the millionaire mine owner of Montana is resting secure in the fact that he practically holds the key to the situation, and that the great telephone development that is taking place will add yearly to his boundless wealth and the wealth of the great state of Montana—where the copper comes from. I might dwell glowingly on the great possibilities of Montana's vast output of copper, when as a manufactured product it is utilized in the art of telephony as applied to-day in this business world, connecting up the various marts of trade and facilitating business and the possibilities of man. I might recite the story of how the poor laboring mining engineer of yesterday has become the millionaire mine owner of to-day; the United States senator of to-morrow, who for pastime builds Fifth avenue mansions and later as a railroad builder does his part in the development of our great west. All this with the income from a copper mine. But of more interest to the members of this convention and the question you would have me answer is, "What is the Independent telephone situation in Montana?"

We are as yet in our infancy, but in the brief space of time feel that wonders have been accomplished. Telephone competition is new in this territory. The pioneer in the Independent telephone development in the state of Montana is P. B. Moss, the noted banker and financier of Billings, who for several years has owned and operated with great success the Mutual Telephone Company's plants in eastern Montana. The territory served by this company has every reason to be proud of the splendid service afforded and the public have shown their appreciation by patronage far in excess of his competitor, the Bell. In number of telephones in the territory covered this company has practically doubled the number of patrons served by its competitor.

Next comes the home telephone plants, which have all been constructed and put in operation during the past year, in the territory directly west of that occupied by the mutual companies. These plants have all begun giving service during the earlier part of this year, and in point of subscribers served and extent of service have surpassed all that has been accomplished in the past ten years in this field by the Bell companies. Directly west of these, in the territory of Butte and Helena, plants are now being built by the Montana Independent Telephone Company. Great progress has been made towards completion and it is safe to say that during the next year there will be spent in this territory by these various companies approximately three million dollars in the development of this field. All plans that are now in operation are connected up with the best of copper toll lines, the construction throughout is standard, and with the completion now under way it is with pardonable pride that we assert Montana will take a front rank among the Independent telephone states.

Independent telephony in Montana owes much to the efforts of W. H. Crumb & Co. of Chicago, through whose perseverance and labor a decision was secured from the Supreme Court of Montana whereby any telephone or telegraph company was permitted to construct their lines in the towns and cities of the state. The sum total of the situation is that the territory is divided into three sections, each covered by allied companies—the Mutual Telephone Company on the east, the Home Telephone Companies in the central and the Montana Independent Company on the west. All of these companies connect for an interchange of business and form a most complete state system.

Taken as a whole the field has proven a fruitful one. The rates are adequate, making a satisfactory investment. In no case has there been any question of getting the business, but only the proposition of being able to supply the demand. We predict that before another convention meets this will have proven to be a banner field in telephone development.—*A Paper read by J. S. Haley before the International Convention.*

MAKING HISTORY IN THE CANADIAN NORTHWEST.

Mr. President and gentlemen: The history of every great movement is rendered more conspicuous by the recording of certain incidents which mark the various stages of progress towards the goal whither such a cause is traveling. Last year, with that generosity and spirit of fraternity which characterizes the American nation, you made a new record by amending the title of your association in order that Canadians might be included in your membership. This year you have rendered the occasion conspicuous by including in your programme for the first time an address dealing with events beyond the limits of your great republic and in the vast dominion to the north of you. Gentlemen, on behalf of all Canadians, I extend to you the most sincere greetings of good fellowship, the most hearty congratulations upon the work you have already accomplished, and the most fervent hope that ever increasing success will crown your efforts in the future until the telephone industry throughout this continent will be permeated with "independence" even as is the glorious constitution of which you are so justly proud.

I must not, however, forget the text which your worthy president was good enough to assign to me, with the added injunction that I must crowd a great deal of material within the time allotted to me. "Making history in the Northwest." In order that you may the better understand that great territory which has for the past year been attracting so much attention in the telephone world, and the most important part of which has recently formed the arena of one of the greatest contests between the Bell monopoly and the people, I purpose giving you a few figures which indicate its great financial and commercial development. In Manitoba, the premier province of this great northwest, last year, sixty-one and a quarter million bushels of wheat was produced on three and a quarter million acres of land by forty-five thousand prosperous farmers. The province has still twenty million acres of virgin prairie open for settlement, capable of producing four hundred million bushels of wheat per annum. During the last five years, the fifteen largest towns which lie between Lake Superior and the Rocky mountains have increased in population 139 per cent, twenty-six towns of from 1,000 to 3,000 inhabitants have increased 96 per cent and twenty-nine towns of from 450 to 1,000 people have increased 65 per cent.

Tax assessments have grown from $36,000 to $139,000 per annum. Branch banks have increased from 131 to 472, while the bank clearings in Winnipeg have advanced from $107,000,000 to $504,500,000. The foreign trade of the northwest increased from $20,750,000 to $55,500,000; the exports last year in horses, cattle, sheep, furs, hides, wool, oats, wheat, flour, oatmeal and wood pulp amounting to $63,000,000, of which the United States took $12,000,000. The area of field crops in 1900 was 3,700,000 acres; last year 9,400,000, of which 4,800,000 acres are in Manitoba. Last year there were 1,592 elevators, with a capacity of 65,093,000 bushels, and fifty-two flour mills, capable of turning out 25,000 barrels a day. From 1901 to last year 709,000 emigrants entered the dominion, 239,000 coming from the United States, the majority of whom settled in the northwest. This, gentlemen, is a brief review of those western provinces, the inhabitants of which have determined that they will provide themselves with a modern and perfectly developed telephone service, without the aid of the Bell monopoly.

Had those responsible for the policy of the Canadian Bell Company been wise in their generation, the conditions which exist to-day in the northwest would be unknown, but with their characteristic apathy and indifference to the people's needs they turned a deaf ear to the demand of the public for a more extended service until it became necessary for the Manitoba government in 1904 to consider the question of enabling the citizens to perform for themselves that which the monopoly had hitherto refused to do. As an evidence of the failure of the Bell to live up to its responsibilities, I may state that at the beginning of 1905, after twenty-four years' undisputed possession of the field, the monopoly had in Manitoba 5,532 telephones, in Alberta 730 and in Saskatchewan 442. Moreover, if we eliminate the telephones in the capital of each province the figures would be: In Manitoba, 1,411; in Alberta, 270; and in Saskatchewan, 174. This in a community of 800,000; one telephone to over 119 inhabitants, including the capitals of Winnipeg, Regina and Calgary, and one telephone to over 369 persons outside of these cities.

With a view to securing to the people of Manitoba an adequate telephone service, after much careful thought and personal study on the part of Premier Roblin and his colleagues, the provincial government appointed a committee of the legislature to inquire into telephone conditions elsewhere. This committee, after securing all available information at home, visited the United States and held investigations in Minneapolis, St. Paul, Chicago and Grand Rapids, Mich., returning to Winnipeg firmly convinced that what had been accomplished by the Independents in your union could with equal success be achieved by the people of Manitoba. It was, however, decided that in order to completely cover the whole province, and more particularly the rural districts, with a properly equipped standard service within reaaonable time, it was absolutely necessary that such means should be adopted as would secure the requisite capital without difficulty, and at a low rate of interest, which was only possible under public ownership. Legislation was therefore introduced by the attorney-general, the Hon. Colin H. Campbell, and passed by the legislature without dissent, providing that: 1. The government would construct and operate a complete long distance service throughout the province. 2. The government upon request of the city councils would build and operate the exchange system in the cities of Winnipeg, Brandon and Portage La Prairie, where the Bell are most strongly entrenched. 3. That any municipality in which 60 per cent of the rate payers voting upon the question signify their wish to establish and operate a municipal telephone system shall be empowered to do so, and that the necessary capital shall be secured by the issue of municipal bonds bearing the en-

dorsation of the provincial treasurer, guaranteeing on behalf of the government payment of the interest and repayment of the principal.

In order to give effect to the last named enactment and to counteract a possible guerilla warfare among the municipalities on the part of the Bell, it was provided that a poll be taken at the municipal elections on December 18 last, in which every rate payer in the province was given the opportunity of voting upon the question, "Shall this municipality own and operate its own telephone system?" A vote in the affirmative gave the council power, subject to the government's approval, to proceed with the work and obtain the necessary capital for construction and extensions from time to time, without any necessity of issuing further bylaws, thereby rendering it impossible for the Bell at any time to harass a municipality in its financing by influencing the electorate to vote against the issuing of bonds to take care of future growth.

Preparatory to the taking of this vote, the government called upon me to conduct a campaign, which from the number of meetings held, territory covered, literature distributed and unanimity of the verdict recorded against the Bell monopoly is without a parallel in the history of the telephone fight on this continent. In this work I was loyally supported by a corps of representative Independent telephone men from both Canada and the United States. In speaking of the result of this campaign up to date, I wish to say that, notwithstanding the gratifying nature of the victory already achieved, the influence it will have in freeing the people from the evils of the Bell monopoly throughout the Dominion of Canada cannot be overestimated. At the time of taking this vote there were in Manitoba 124 municipalities, in which the Bell had 49 exchanges. Those municipalities voting against the continuance of the monopoly represented 36 Bell exchanges and 9,000 subscribers (including Winnipeg, where the majority was 3 to 1), while those voting against the government's policy represented 13 Bell exchanges and 498 subscribers. Truly an undeniable demonstration of the fact that Bell methods had been "weighed in the balance and found wanting." This, gentlemen, was not the verdict of a number of enthusiastic Independent telephone men or of investors in local telephone companies and their friends, but simply the spontaneous and unbiassed judgment of the dwellers in a number of separate communities, scattered over several hundred miles of territory. The government of Manitoba, acting in compliance with the mandate of the people, is preparing to build a complete system of toll lines, comprising approximately 1,500 miles of pole route, to connect the various local exchanges with Winnipeg, just as soon as the municipalities have their systems installed. The government long distance system will connect with the lines of the Tri-State company of Minneapolis, and thus form a link with the Canadian northwest and the Independent companies on your side of the border.

The government is also making arrangements to commence the construction of a plant in the city of Winnipeg for 10,000 telephones, with an ultimate capacity of 20,000;; also one in Brandon for 1,000 telephones, with an ultimate capacity of 5,000, the councils of both these cities having, by resolution, requested the government to provide these services. Portage La Prairie has not yet made any decision, but the legislation provides that the government will establish a local service in that city, and in all other municipalities in which the telephone bylaw did not carry, upon the request of a reasonable number of rate payers. In this way there will be no missing links to the provincial system when it has been completed. In regard to the municipal town and rural systems, already a number of municipalities are being canvassed for subscribers, and the results to date are most encouraging. In the first municipality canvassed, out of 450 farms 300 signed contracts, at $15 per annum, have been obtained before a single pole has been ordered. In the two neighboring municipalities almost the same proportion of subscribers had been secured. As there are 124 municipalities in the province, it is a matter of simple arithmetic to estimate approximately what the total result will be when the government and the municipalities have completely developed the service. I venture to prophesy that three years hence there will not be less than 50,000 telephones in Manitoba, connecting with the provincial long distance lines, instead of the 5,600 which the Bell had when the government inaugurated its present policy.

Time will not permit me to more than touch upon the conditions in the other western provinces east of the Rocky mountains, but my paper would not be complete without a reference to them. In Alberta the provincial government has adopted a policy similar to that of Manitoba, and has already completed some hundred miles of toll lines, including one between Calgary and Banff, eighty-two miles. Calgary recently passed, by a large majority, a bylaw voting $120,000 to build and operate a municipal system in that city Edmonton has been operating a municipal service for two years, and will this year install an automatic system for 2,000 telephones. The smaller towns and rural districts in this province will have either municipal or government systems.

In Saskatchewan, the neighboring province of Manitoba, the legislature this year voted $6,000 for preliminary work in regard to telephones, with a view to following the example of Manitoba and Alberta. East of Manitoba to the lakes there are only three cities of importance—viz.: Kenora, Fort William and Port Arthur—and each of these municipalities owns and operates its telephone system, there being in the last two cities 1,800 municipal telephones, as compared with 200 Bell subscribers.

In conclusion, I think you will agree with me, gentlemen, that the progressive people of the Canadian west have given unmistakable warning to the Bell to quit its camping ground, and I have no hesitation in saying that five years hence there will not be a telephone in the dominion west of Lake Superior controlled by that monopoly. Instead there will be a complete and modern service with a telephone in every farmhouse, having local and long distance connection with every village, town and city in the west, and with the Independent systems in the adjoining states over the border, as far as the art of telephony will permit conversation. In short, we contemplate having a system which, in point of good service, moderate rates and complete development, will be unequaled in the whole world.

The people of western Canada have measured swords with the Bell Telephone Company and enter the contest with absolute confidence as to the result.

Gentlemen, whatever may be the ultimate outcome of the fight which you are so nobly waging in the interests of the people and against monopoly, the Independent movement to the east of us will, I hope, find an added inspiration in the knowledge that—

"Not by eastern windows only when daylight comes floods in the light;
Far back the sun moves slow—how slowly—but westward look; the land is bright."

—A Paper read by F. Dagger before the International Convention.

COMPULSORY TELEPHONE CONNECTION.

Last February I received a telegram from the President of the International Independent Telephone Association asking me to go to Raleigh, North Carolina, to assist in some telephone legislation pending in that state. When I reached Raleigh I found the manager of the Raleigh Telephone Company, Mr. Winn, and with him began an investigation of the pending telephone legislation and also some contemplated legislation. I found upon investigtion that the chairman of the committee on public service corporations lived in a town where the Bell had recently sub-licensed an Independent telephone company, but there was one little connecting Independent company that refused to enter into this mis-alliance and held out to the end and installed a pay-station in the town in which the said chairman lived. It so happened that this little Independent line connected with the town in which the aforesaid chairman formerly resided and where he had considerable business. It was necessary for him to go to the pay-station in order to get connection with the city of his nativity, hence he conceived the idea of compelling this little Independent company to connect with the Bell company in the city in which he resided and assisting in maintaining therein a joint agency to check all messages going over the lines between the two companies. This was the first provision of his bill—the maintaining of a joint agency. It only needs to be presented to show how absurd was the position of the aforesaid chairman.

To maintain a joint agent would make additional expense such that the little Independent company could not afford to pay. It would be much better, indeed, for it to abandon the station than attempt such a thing. The result in this town would have been that the Bell sub-licensee would, of course, obtain all the business practically, and thus drive out the little Independent company and keep them from developing and building an exchange in this city. It would give the Bell monopoly entire control of business. Competition would be destroyed and the sub-licensee would render such service and charge such rates as it desired. It has been demonstrated time and again that competition is the life of trade, and so it is the life of the telephone business. One company is apt to become arrogant in its demeanor and exorbitant in its rates if left to itself. The result is always to the disadvantage of the subscriber, in that he would have fewer telephones over which to reach people if there were but one company. In other words, my opinion is that a compulsory connection would eliminate one company from the local field and thus result in the confiscation of his property. No extension of lines would give the Bell all local points. It does not want to take care of farmers and small towns in our territory, for they claim that these are operated at a loss.

One of the arguments advanced for this physical connection of telephones is that the railroad companies are compelled to connect. They are on an entirely different basis. In the railroad business the motor power of the company receiving the car takes charge in connection with its own means of hauling all its load, whereas in the telephone business all connection would be made and the instruments would be of the opposing company and the lines used would be those of the opposing company. The service would be just what the company receiving the message would desire to give. In other words, if the Independent company were to use the toll lines of the Bell they would hear that the lines were busy or in trouble, and it would be impossible for the Independent companies to do business over these lines, and vice versa.

The chain is no stronger than its weakest link, so that this compulsory connection, it seems to me, is weak in two particulars: First: There could be no arrangement between operating companies of such a character as to be mutually satisfactory to each company, and good service would require that all operating rules should

be alike and that there should be some central authority responsible for defects in operation, and this requires the apparatus to be of such a type as to give the best service—in fact, to compel two opposing companies to connect would be a farce. It is unnatural to expect that any company would give its best service to its competitor and injure its good name. Even now companies get credit for poor sense by connecting with small companies. It would result in poor service. One company would seek to injure the other company by saying that trouble was occasioned by their defective apparatus.

Second: It would retard the development of the telephone business. No Independent operator or Bell either, for that matter, would put money in a town in the building up of a telephone business in which there was already an operating company if it thought compulsory connection would obtain and that their competitor would have advantage of their expensive development, for it would amount to practically confiscation of their property, small companies springing up.

I do not believe in all cases those who have introduced these bills have had merely some private business to move them, but think that the desire to promote the public welfare has in many instances caused legislators to introduce these bills, thinking that the people were unanimous for the connection and would benefit by it. Indeed, one member of the North Carolina legislature thought that it would be doing the Independent telephone companies a great favor by giving them the benefit of the Bell long distance lines.

The thing for the Independent people to do is to stand by the people squarely and show to them that it would be to their detriment, and not, on the contrary, to their welfare.—*A paper read by J. Walter Barnes before the International Convention at Chicago.*

THE TOLL LINE CLEARING HOUSE.

Mr. Stadelman has told us comprehensively how to advertise the fact that there are long distance Independent lines, Mr. Tarte has outlined a general scheme for improving these lines, and Mr. Hart has directed us into the right way to handle the business produced by the advertising and improvement of our long distance lines, and we find ourselves approaching the question of what to do with the proceeds of the business so developed and handled. This question appears of varying importance in exact ratio to the number of companies participating in any one message or group of messages. If all long distance lines were owned by one company the obvious answer would be, Send them to the auditor's office. Very unfortunately for the strength it begets through the diversified ownership and interest, but unfortunately from the weakness it begets in clerical and accounting methods, our long distance lines are made up of sections, owned and controlled by widely different individuals or companies, and we find it no unusual thing for as many as five or six companies to participate in the handling of one single message. A condition which is growing worse as fast as the improvement in lines is increasing the distance in miles traveled by the average message.

For companies situated as above the question takes on great significance, and the only comprehensive answer yet developed which gives promise of its tenability is, "The toll line clearing house," or, in other words, "a co-operative auditor," which derives its membership and support from the companies referred to above.

The organization of several of these clearing houses in as many of the middle west states has resulted in an immediate and invaluable improvement along several lines. Notably, standardization of clerical methods and equitable distribution of earnings; but with these successes has come a keen appreciation of the many difficulties attendant upon the just, equitable and economical accomplishment of this great task. And it is of these difficulties I wish to talk to you more particularly today, with the idea in mind that the comprehensive discussion to follow, which discussion, by the way, was the predominant motive for the preparation of this paper, may result in a great and lasting benefit to all these interested in still further making our shield the emblem to be looked for by the general public when first-class long distance service is desired.

For our later convenience I shall divide the matter into three general subjects.

First: Probably the one great question that first presents itself to those originating a clearing house is, Upon what basis shall the joint earnings of interchanged business be divided? Basing our judgment upon the experience of one of our brother organizations, the Iowa Independent telephone clearing house, decided that the most equitable and at the same time the most economical plan would be to ascertain the total revenue accruing from all messages sent from one company's stations for one month; the total mileage traveled by these messages, and by dividing the revenue by the mileage to establish an average message mile rate for that company for that month's business. The originating commission being first deducted, the message mile rate, ascertained as above, was then used in apportioning the earnings to the various lines, during which apportionment each interested company's mileage was measured on an air line between junction points.

Before we had been using this method very long discrepancies began to appear that were very hard to locate; diligent search, however, revealed an average inaccuracy of from one-half to one and a half per cent, due to the fact that we were using an average message mile rate instead of an exact one, and it also revealed that the inaccuracy, though small, always fell in the same place instead of being equally distributed among all of the clearing companies. Furthermore, it seemed unjust to clear a message that traveled in one direction on a different basis than a message traveling in an opposite direction over exactly the same circuit, which condition was brought about by the originating companies' message mile rate in each case governing the transaction.

After eighteen months experimenting with this method, the Iowa Independent telephone clearing house is about to abandon it in favor of one which, while more expensive at the outset, will, we believe, be ultimately cheaper, and will, we know, be at all times absolutely correct.

We have begun the preparation of an alphabetically arranged card system in which each card indicates the percentage due each participating company, for any one message, or group of messages. In determining the percentage, originating commissions, mileage earnings and terminating charges, if any, are all taken into consideration. This, while a huge task, as in Iowa alone there will be something over 4,000 cards, reduces the pro rating work to a minimum and will at once reduce the cost of the entire clearing house operation.

If there are two possible routes for the same message, both will be shown upon the same card; as will also be shown the distribution under the night rate where it is used.

The second difficulty presented itself when we came to prorate the earnings from messages paid for in coupons, which are almost universally sold at a standard discount. Under the message mile rate plan the coupon discount merely reduced the message mile rate by a small fraction, and thus spread the loss evenly over all clearing companies, whether they actually participated in handling that class of mesages or not.

We shall in the future endeavor to designate messages of this kind, so that the discount may be deducted where it belongs; but this is very difficult of accomplishment and but a partial remedy at the best. I would urge upon you gentlemen today the advisability of gradually adjusting this matter, with the ultimate idea of entirely discontinuing the sale of coupons at a discount.

The third and last of the problems upon which I shall spend a few moments is that of the foreign company who participates in handling long distance business. For this there are two clear and defined remedies. The first and best—secure their affiliations and support. The second—hold all clearing companies responsible for business turned onto clearing house lines, being careful, however, to give them due credit for all balances due the foreign connecting companies.

Leaving, now, some of the most troublesome things, I would call your attention to what we Iowans believe to be one of the strongest if not the very strongest point in our method of accounting—namely, the use of numbered tickets for recording messages. This immediately lifts each message from among its fellows and stamps it with an individuality, which is of great value. If operators are required to exchange these numbers when handling traffic, the resulting accuracy and ease with which errors may be detected much more than offsets the possible slight loss of time in so doing. It is a remarkably good feature and entirely worthy of your combined support.

Again, the toll line clearing house is the logical and only practical place at which to compile valuable stable foundations upon which to build future successes.

Had each state had its clearing house, this International association could have long ago prepared the maps of the states upon which it has labored with too little of our co-operation, but it is useless to dwell further upon the advantages which accrue through co-operation, when our presence here from year to year, in constantly increasing numbers, is of itself concrete evidence of our constantly appreciating ideas of its value to our cause.

I had thought to apologize for the probable provincial tone of this paper, because of its being largely based on the experiences of the Iowa Independent telephone clearing house, but, rather, I am going to declare my pride in the opportunity of placing within your reach any advantages which Iowa, at all times in the front rank of Independent telephony's development, has been able to secure.—*Paper read by J. M. Plaister before the International Convention, Chicago.*

RURAL TELEPHONY—ITS RELATION TO THE COMMUNITY.

No community liveth unto itself in this age of progress and development. Our wants are so many and so varied, our inability to supply these of ourselves so apparent, that we are dependent upon others for the satisfaction of our needs. This has made it all important that every section of our great land should be in almost instant touch with not only every other section but with the world at large. The means of communication have multiplied so rapidly and are so many and varied that this is

now almost an accomplished fact. The development of our transportation facilities, the building of great transcontinental railroad lines, the extension of existing systems, until nearly every hamlet is supplied with railroad advantages, was the first great factor in bringing about this result. The improvement of the waterways, the natural highways of the nation, made further progress toward the same end. The telegraph improved the situation and made it possible to flash the world's intelligence across the country in the twinkling of an eye and linked together nearly every village in the land. The long distance telephone accomplished still greater results and annihilated distances by bringing people far removed from each other in almost personal contact through personal conversation. And now it remains for the rural telephone to fill in the waste places and round out and make the situation complete, for when every farmhouse in the land is supplied with a telephone, connecting it with the rural exchanges and through them with the uttermost parts of the country through long distance lines, the ideal will have been accomplished. The rural telephone is no longer an experiment. It is an accomplished fact. It has ceased to be a luxury. It is now a household necessity. It is now as important an accessory of the farm as a reaper, binder, cream separator or other modern piece of machinery. No inhabitant of the farm can afford from a material point of view alone to be without it, to say nothing of the comfort and sense of security which comes with its possession.

And what a transformation it has wrought in the life of the rural communities! How changed the situation of the American farmer as compared with but a few years ago! Time was when life upon the farm meant exile. Even in thickly settled farming communities the inhabitants necessarily lived some distance apart. They were practically shut off from the outside world. The great events of the world's movements had passed into history ere they were even apprised of what was really going on. Communication with their immediate neighbors was only occasional and dependent in the main upon social, church or political gatherings, which were usually few and far between. There were, of course, the visits to the village store on market days to replenish the family larder, get the mail and exchange items of local news and gossip. These were real moments of great interest, surpassed only by the rare visits to the neighboring great city to attend a circus or the county fair. The newspapers and the exchange of letters with distant relatives kept them only slightly in touch with the great world beyond their rural environment. Life on the farm, because of its isolation, was something to be dreaded by the rising generation rather than to be welcomed and looked forward to with pleasure as the ideal existence close to nature. How wonderful the change really is can only be appreciated by taking time to look back and note the conditions of things a few years ago and compare them with the situation today.

First came the rural mail delivery, with its blessings of a daily mail. What a relief to be able to count on the appearance of this regular visitor! In rain or sunshine, in snow or hail, the mailman makes his daily round, constantly reminding the farmer that he is one of the important factors in the life of the nation and keeping him in touch with the world about him. And what an advantage the rural mail delivery was to him! What an economy in time and money! How many trips to the village store or to the neighboring city were now made unnecessary. An order sent one day to supply a household want brought the required articles to his door on the morrow. It made the daily newspaper a possibility on the farm wherein the farmer might read the market reports from day to day and keep himself informed concerning the great happenings of the world almost as quickly as the residents of the city. The rural mail delivery was but the forerunner of the rural telephone. The former emancipated the farmer to a limited extent from his isolation on the farm; the rural telephone takes advantage of the door of opportunity opened by the rural mail delivery and offers to strike the shackles entirely from his restricted life. By its magic influence the farmer is brought into instant and constant touch with his fellows and with the world about him. It stands as his ready servant, obedient to his will, to supply his every need and fill his every want. A social chat with this neighbor, a friendly conversation or the communication of an item or family news to nearer relatives and friends, a business transaction with the village merchant or a bit of world important news over the wire are his without stepping from his door. By its means he arranges with his neighbors for a raising bee or for taking care of his next day's threshing, calls the village store and orders his supplies for the house, postpones a business engagement because of some unforeseen event making it impossible for him to be present, saving himself the embarrassment of an unfulfilled engagement and the other party the loss of time in keeping his to no purpose. In a thousand ways the telephone enters into the life on the farm in a practical way. In case of a breakdown on the harvest field, when the immediate repair of the broken machinery is a matter of considerable moment, the telephone comes to the rescue, gives the order to the implement house in an instant and at once the defective part is on its way to save the farmer from great loss and greater annoyance. He keeps in touch from day to day and from hour to hour with the state of the market and closes business deals of vast importance and consequence in reliance upon information which he receives which is up to date and authentic. Many times the cost of the annual rental may be saved to him by being advised of the predictions of the weather bureau which are available to the subscribers on rural lines.

But in time of need and danger what a blessing the telephone really is. Anxiety and distress of mind, which formerly attended the hasty trip to the family doctor miles away, in cases of sudden illness, now gives way to peace of mind and a sense of security when the telephone advises that the physician is on his way to relieve the pain and distress of the sick one. From every point of view the telephone must henceforth be reckoned with as one of the things the farmer cannot and ought not dispense with.

But the rural telephone plays a larger part than its influence upon the farmer himself and his life upon the farm. Every rural telephone line enlarges the life of the community which has access by means of it to the subscribers on the line. The patrons of the village or city exchange are given a wider field for operation in the business, social and political field.

And I believe that its influence is going to be felt in still another direction. We have all noticed before the advent of the rural telephone that the farms seemed to have lost their attraction for the youth of any land. The tendency was toward the centers of population, the great cities, which seemed to attract the youths from our farms, often to their undoing as some great light lures moths to destruction. The rural telephone has thrown out the life line to the farming communities. It has made life upon the farm, sweeter, happier, more comfortable and more bearable, and its effect will be to repress the tendency of drifting from the farms to the great centers of population and activity in the large cities.

That the rural communities realize the importance of the rural telephone is apparent from the tremendous increase in the number of rural telephones in the past few years. Everywhere rural lines are being run bringing thousands upon thousands within the realm of its beneficial influence. The demand for rural telephones is taxing the financial ability of the local telephone companies to furnish them, and where these cannot supply the demand, the farmers are themselves organizing mutual companies for the construction of farm lines. That a great opportunity presents itself to the Independent companies in the direction of developing the farm line business must be apparent to the most casual observer. The Bell company has long been unable to meet even the competition of the Independents in the cities. It has already abandoned the field to the Independents in many places and is now expending all its energy toward saving its long distance business, by making alliances and connections with the Independents, which a few years ago it would have scorned with contempt. The companies which control the farm lines and the farm line connections are going to have a tremendous advantage over their competitors which cannot offer connections with the rural communities. It seems wise, therefore, that the Independents should make the most of this opportunity to take and hold the farm line business and make themselves secure in the territory in which they operate.

As already stated, the demand for rural telephones is so great that it is difficult to supply the demand. This has given rise to many small local mutual farmers' lines. As a rule such lines built upon the mutual basis are poorly and cheaply constructed. The promoters are necessarily without experience in this line of endeavor and do not appreciate the importance of good construction and constant supervision. A word of warning and counsel to all who would engage in the construction of such lines would seem appropriate here. Supply houses are too frequently responsible for the construction and maintenance of mutual lines. Of course, when the supply house has sold the equipment, its object has been attained, no matter what the consequences may be with the purchasers. Beginners in the telephone business do not know when they begin, and learn only by experience, that the telephone business, is a real business, and can only be successful when engaged in on right principles and carried on by persons who understand the business. Mutual farm lines companies with rare exceptions run the same course, and have a brief existence, ending with the surrender or abandonment of their lines to companies organized for the proper conduct of the business, after learning that good and satisfactory service can only be had by good construction and constant supervision, which is almost impossible of attainment in mutual companies. In the end it will be found that a telephone is only a source of annoyance and discontent unless it can be relied upon at all times and in every stress and that it is cheaper and more satisfactory to get service from a properly organized telephone company than to rely on mutual organization.

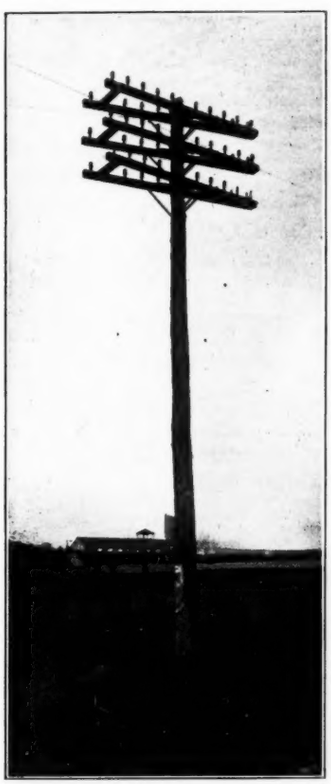
The rural telephone has great possibilities for the future. The field is just beginning to be developed. The day is not far distant when every farm house in every community will have its telephone, and when this has been accomplished, the millenium will not quite have been reached, but the farmer will be the happiest and most contented man in the community, and the telephone man will share in his joy and pleasure for having made him so.—*Paper read by Charles H. Schweizer before the International Convention, Chicago.*

A FEW HINTS ON DOUBLE ARMS AND GUYS

For the Benefit of Those Building Telephone Toll Lines

By L. W. Carroll

IT WILL be the aim of the writer to give, in this article, a few hints on double-arm construction which will be new to at least some of those engaged in construction work. Many of the suggestions printed in the technical journals are read and probably submitted to the superintendent of the work on hand, only to be turned down, either from prejudice to new ideas or from being incompetent to carry out the work. The proper way to demonstrate the value of an idea is to put it into practice, and it should be the duty of the superintendent to give a trial to every new idea which might be of value in decreasing the cost of construction, or in making a more permanent job.



A Type of Double Cross Arm Construction.

In order to secure economical use of material in any kind of structural work, it is necessary to place each piece of material where it will receive its proper proportion of the strain. For illustration, take the double arm as usually placed on a two-pole corner. It will be seen, from a little study of Figure 1 that the arm on the head of the lead is receiving nearly all of the strain, and that the back arm might easily be taken off after the wires are tied and not, in any way, affect the rigidness. We find, from this, that about all the good the back arm does is to stiffen the corner while the wires are being pulled, and for reserve strength in case the head arm or pins should break.

On referring to Figures 2 and 3, we find that each of the pins on one arm receives an equal amount of strain, relative to the pins on the other arm, consequently the two arms have equal strains. It may be well to add that, while the pole may be held by a quarter guy, it is always better to use head and side guys, as they will hold the pole in case the other corner goes down.

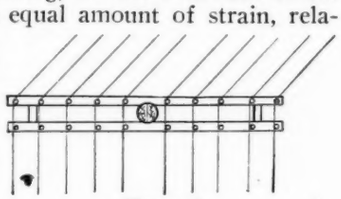


Figure 1.

Figure 3 shows the construction for a two-pole corner using six-pin arms, and is not only a very substantial arrangement, but also quite inexpensive, as only two bolts are used and no block at end is necessary.

Figure 2 is a corner constructed in the same manner, using ten-pin arms and a block at the outer end. A good way to fasten these blocks is to drive a couple of thirty-penny spikes through the cross-arm into the ends of the blocks and to locate a one-half-inch bolt just outside of the block, thus saving the boring of the blocks. However, this will not be necessary if harrow spools, having holes already bored, are used. It may be added that these spools are turned pieces of wood about three inches in diameter with a five-eighths-inch hole through the center, and they may be secured in various lengths, usually about fourteen inches long, from most of the houses handling construction material. Quite a saving in time and patience, besides a very neat job, may be had by using these spools.

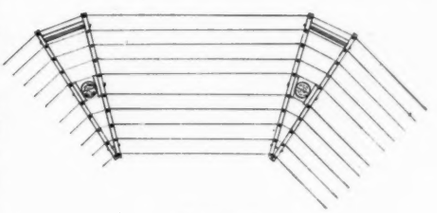


Figure 2.

Figures 4 and 5 show a single-pole corner using the *A* arm construction, the dimensions of the various parts being as shown. It is well to select a pole with at least an eight-inch top for this corner, in order to make a good job of it.

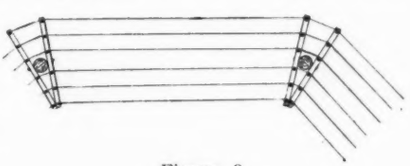


Figure 3.

The long bolt *A* should be five-eighths inch, threaded at both ends and supplied with large square washers. There should also be a one-half-inch bolt *E* just below the center for holding the ends together. The piece *C* is to be made from a cross-arm from which the pins have been removed and should be bored for the standard cross-arm brace as shown. The ends may be fastened by four thirty-penny spikes in each end. The piece *B* may be made from two-inch pine of same width as cross-arm and the ends are fastened by two pieces of Number 16 or 18 galvanized sheet iron, using six-penny wire nails. The brace *F* may be one-inch iron pipe or one and one-quarter-inch angle iron, and the ends should be flattened out and drilled for the five-eighths-inch bolt at one end and the lag screw at the other. In case it is necessary to use more than one arm, the brace *F* should be placed on the bottom arm and an extension made between the lower and upper arms. This piece should be made of one-quarter-inch by one and one-half inch flat iron with a five-eighths-inch hole at both ends, the distance between centers being the same as those in the pole for

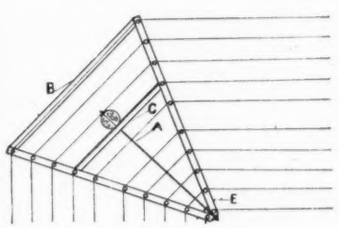


Figure 4.

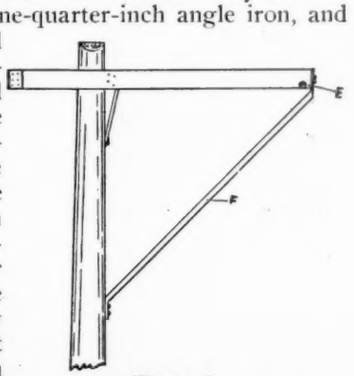


Figure 5.

the arms. The guying for this corner should be the same as would be used for a regular buck arm.

From personal experience, I have found a good substitute for the usual dead man or slug in the shape of old discs taken from the pulverizer, or disc harrow. These may be bought from the junk man for five to ten cents each. They are from twelve inches to sixteen inches in diameter, with a one and one-half-inch hole in the center, and may be used with almost any kind of guy rod by placing a large iron washer just under the nut. As to the lasting qualities, it may be said that they will outlast a wooden slug, and as they will hold as much strain as a four-foot slug made from a pole and costing twenty cents, it is plain that they are much cheaper. There is also a considerable saving in the labor of setting them, as a hole may be dug similar to a hole for a pole in about one-fourth of the time required to dig a square hole for the old-style slug. Care should be used that the hole shall be dug on the same angle as that made by the guy from the pole to the guy rod. One of the guy slugs set six feet deep and 15 feet from bottom of a twenty-five-foot pole will hold a lead of ten Number 12 wires dead-ended,

There are few who realize the importance of placing guy anchors as far as possible from the pole or guy stub. For illustration, take a pole twenty-one feet above the ground with an anchor set three feet from the bottom of the pole. You will find that, for every 1,000 pounds' pull at the top, there will be 7,000 pounds' pull up on the anchor. Now, by setting the anchor fifteen feet from the bottom of the pole with 1,000 pounds' pull at the top, you will get only 1,400 pounds' pull on the anchor, or one-fifth of the strain. Of course, it is not always convenient to place guy anchors this far from a pole, but it should be done wherever possible, even if it is necessary to purchase the right to set over a few feet on private property. In the purchase of right of way for poles or guys, it may be well to caution the purchaser not to receive right of way gratis or without a signed receipt stating the terms of contract, the amount paid and the time covered by the same.

It is customary to pay from $1.00 up for right of way for poles and guy anchors, though where there are quite a number of poles it is often less. The duration of the contract is generally ninety-nine years, and although this may be varied to suit conditions, it is not advisable to contract for a shorter period than ten years.

THE USE OF TELEPHONES IN COAL MINES.

No well-organized coal mine can afford to be without a telephone system, even though the operations are comparatively small. Many mines have installed systems in which only three telephones are in use. The cost of constructing a line underground is usually less than outside, due to the fact that no poles are required, and there are no holes to dig. The wire can be supported from the roof, using porcelain or glass insulators. In designing a telephone for mine use, there must be a full realization of the severe conditions to which such a telephone is constantly exposed, and certain requirements in design are necessary. The apparatus needed for the operation of the instrument should be mounted in a heavy cast-iron box, which is treated with some insulating compound that effectively preserves it from weather, dampness, and the acid fumes present in mines. The door of this case should close against a rubber gasket rendering the inside arrangement free from outside disturbances. Each telephone should be equipped with a standard long-distance transmitter and receiver, a powerful hand generator induction coil, and two dry battery cells, says the Engineering and Mining Journal. There should be a dome in the upper part of the case having an opening on each side, so that the bell may be mounted there, and can be heard at some distance from the telephone.

All wiring of the instrument should be rubber covered, and the joints soldered. The induction and receiver coils are improved by boiling in a moisture-proof shellac varnish, and afterward baked, rendering them moisture-proof. The transmitter should be supported between four posts held in place by coiled springs to prevent it from picking up any outside noise or vibrations. A small cap containing the line-binding posts may be fastened to the bottom of the case. Line wires for same can be led out through an iron pipe screwed into the cap. It would require much time and space to enumerate the many advantages accruing from the use of telephones in mines; however, the principal benefit derived is undoubtedly in the case of accidents, whether they be to the working machinery or to individuals. Nothing gives the superintendent of a mine so complete control over all parts of the workings as a connecting system of telephones.

TRIED BY TELEPHONE.

The town of Tarrant, Wis., has taken a step far in advance of older and larger communities in the matter of simplifying the process of law and expediting the operation of justice. This is the manner in which the reform was initiated by a justice of the peace, a telephone, and an offender:

"Hello, John. Say, I wish you would come down to my court to-day."

"What for?"

"The town marshal has sworn out a warrant against you for beating him up election day. I want to try you."

"Can't do it, Judge. I'm too busy."

"I'll have to send a constable after you."

"But I'm busy husking corn and buildin' a fence around my east forty. Why don't you try me now?"

"All right. Are you guilty?"

"Yep."

"Five dollars."

"All right, Judge. I will send it down by the rural mail carrier. Good-bye."

Everywhere, as well as in Tarrant, Wis., the telephone and the postoffice are employed in the transaction of all kinds of business. You sit at the end of an extension telephone in your dining-room, while sipping your breakfast coffee, and start business that will help keep the mails a-going during the afternoon. There is scarcely anything which you cannot do as well by ringing people up as you could by making personal calls upon them.

Then, why is it not perfectly proper as well as perfectly feasible to transact one's legal business in the same way, assuming that one has legal business to transact. Why should it be necessary for people to swarm to a crowded court? Why could not the judge, as well as the justice, sitting in his pleasant little breakfast room, do a nice forenoon's business in something like this fashion:

"Hello! That you, Jones?"

"Yes."

"Listen to the indictment."

"Well, I'm guilty."

"Four years. Take the 1:45 for Joliet."

Or like this:

"Hello, Smith."

"I recognize your voice, Judge—what is it?"

"Petty larceny."

"Waive trial; what's the fine?"

"Ten dollars and costs."

"All right; mail your check by special delivery."

It is unnecessary to follow this matter to its logical conclusion. The dullest can see that its possibilities are illimitable. It might save the public a lot of expense.

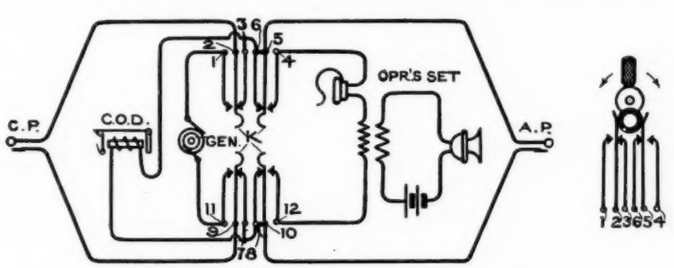
It is a question, indeed, whether we are not throwing away money in building the new court-house.

QUESTIONS AND ANSWERS

By H. P. Clausen

I HAVE a Stromberg-Carlson fifteen-line capacity switchboard. It is second hand. We use grounded lines, bridging, but the board is wired metallic. It works all right except we can't get the clearing out drops to work. Would you kindly tell me where the trouble would likely be found? What are the most common troubles to which clearing out drops are subject and how remedied? Only three line drops are installed. There are two listening and ringing keys and I notice that on the key on the left side of the board there are six wires soldered to the key terminals on the front, that is the side of the key farthest from the back board. The key terminals, as I call them (although it may not be technically correct), are little strips of German silver that project down from the body of the key, terminals one and four have two wires soldered to each; two and five each have one wire and three and six terminals, which stick straight down (on each side of a tolerably heavy strip of metal, which seems to be the frame or back bone of the key), have no wires connected to them at all. The right hand key, front side, has one wire soldered to each of the four terminals—one, two, four and five, but none attached to the points three and six. So that one key has six wires and the other only four. Why is this difference and could it have anything to do with the clearing out failure? I wish you could send me a sketch showing what each of these tips on both sides of the keys are for.—C. M. G., New Mexico.

It is very difficult to state just where the wires on your ringing and listening keys connect, but if you will refer to the diagram below it may assist you in locating the exact connections. The diagram, as you will observe, represents a complete cord circuit, ordinarily termed one-way ringing and listening type. A clearing-out drop is shown connected across the back contact of the ringing and listening key. It is only under exceptional circumstances that the clearing-out drop is so arranged that it is disconnected from the cord circuit while listening in. Therefore, it has been shown bridged across the cord as is the usual practice. You will observe that springs Nos. *1* and *11* connect to the ringing generator. Now when different keys are mounted alongside of each other, it is the usual practice for the wires from the first key to extend to the second key and loop in at the different ringing springs; therefore you will find, in some places, two wires in a spring. The same is true of springs *4* and *12*, which show the operator's telephone connection. The same case of looping the wires through the

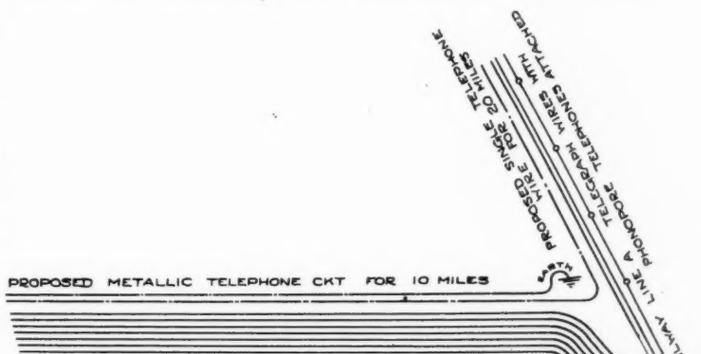


Connections of Ringing and Listening Key.

keys will be found present here. As respects springs *2* and *9*, these normally rest in contact with springs *3* and *7*, and connect together with springs *5* and *10*. Sometimes a spring, *6* and *8*, is installed for the purpose of holding the spring *5* and *10* in proper position. As a rule, however, the *6* and *8* springs do not perform any function.

Your ringing-off difficulty is probably due to your having a clearing-out drop of too high resistance, for if you connect, say, the answering cord to a line equipped with an 80-ohm ringer at the telephone, and with a clearing-out drop wound to 1,000 ohms, it would be possible that when you endeavored to ring off from a telephone connected to the calling cord circuit, the clearing-out drop will not be energized, for the current available from the calling station will pass through the 80-ohm ringer of the telephone connected to the answering cord, and therefore rob the clearing-out drop of current necessary for operating it. In looking at one side of the ringing and listening keys, the relative location of the spring is shown by the diagram. If your circuits are different than outlined above it will be necessary for you to send them to us for examination in order to obtain more satisfactory advice as to the probable location of your trouble.

I want to establish telephone communication between two points thirty miles apart, as shown on the attached diagram. I am able to erect a single No. 9 G. I. wire over a railway line for 20 miles of the route, and a metallic circuit of 2 No. 12½ copper wires over another railway line for the remaining 10 miles. On the first railway there are a quantity of phonopore telephones


PROPOSED METALLIC TELEPHONE CKT FOR 10 MILES
PROPOSED SINGLE WIRE FOR 20 MILES TELEGRAPH & TELEPHONE
RAILWAY LINE A TELEGRAPH WIRES WITH PHONOPORE TELEPHONES ATTACHED
TELEGRAPH & TELEPHONE CIRCUITS ON RAILWAY LINE B
ALL TELEPHONE CIRCUITS ON THIS LINE ARE METALLIC

Telephone Lines on Telegraph Poles.

working, on a single needle telegraph wire, and on the second railway there are a number of ordinary telephone circuits (not phonopore telephones). What chance have I of establishing a reliable service by using a repeating coil at the end of the ten miles of metallic circuit?—C. London, England.

You may install a repeating coil at the junction point between the ten and twenty-mile lines, but the difficulty in your case will be in the direction of keeping the circuits sufficiently quiet for permitting a telephone conversation to be held. If you can arrange the telephones on the twenty-mile line to operate on a phantom circuit plan, using some of the telegraph leads, then it may be possible to produce a service which will be fairly satisfactory. You will understand that the inductive noise from the telegraph circuits on the twenty-mile line will be so great that it will practically drown out any conversation which may pass over the circuit. A design of suitable repeating coil to be placed between the junction of the ten and twenty-mile line will not present any difficulty aside from the difficulty which you may experience in signaling over the repeater. A high-frequency telephonic call apparatus, however, can be provided and does give comparatively satisfactory results under actual service conditions. Get more details as to the exact arrangement of the telegraph circuits and it may be possible to submit a plan to you which will permit you to render telephone service between the points mentioned.

I have recently had an experience with dry cell batteries which I believe may prove of interest to your readers. I find that by removing the paper cases and subjecting the cell to a slow gentle heat until the compound begins to rise up and boil slightly at the top

of battery it is possible to renew the strength of about eight per cent of the cells. By subjecting the outside of an exhausted cell to the flame of a blow torch for about three minutes apparently imparts a renewed life nearly equal to that of an unused battery, and I have been led to conjecture that the chemical action of this process is similar in nature to that accomplished by treating a bank of cells to a heavy direct current. I should also judge that a number of cells might be placed in an oven and baked with advantageous results.—W. C. P., Idaho.

You suggest that a number of dry cells may be placed in an oven and baked with advantageous results. Obviously, you have lost sight of the fact that a dry cell, when it really is a dry cell, is no longer of any use as a source of electric current. It is the moisture in the cell which permits of a chemical action to take place and produce a current. Your experiments of heating the compound merely tend to loosen up the particles which may have become combined in the cell, and it is the loosening of these particles which will release the gas contained in the cell, and it is due to this "shaking up" that you appear to have obtained an increased effect. It is thought that if you had opened up the cell at the top and poured in a salammoniac solution, you would have been able to discover still more encouraging effects, and had you used an acid, say, either sulphuric or nitric, your results would have been so encouraging that a few weeks' service of the "doped up" cell would have been necessary in order to convince you that all rejuvenating processes are only different ways to hasten the day when the battery must be thrown away as absolutely worthless. However, to give a definite answer to your query—when you heat a dry cell to a point where the liquids begin to evaporate, it is merely a question of the length of time that you subject the cell to the heating process when it will be absolutely dry and worthless.

I am trying to amuse my neighbors by means of transmitting speech and music over telephone lines by means of the phonograph and should like to know the best way to arrange a transmitter in connection with the phonograph in such a way that the parties listening at the receiver can hear the music more clearly and with more volume than can be done with the arrangement I am using at the present time. This consists of two telephones of the push button type and comprises a watch case receiver and compact type of transmitter. The line is about 500 feet in length and of No. 12 gauge insulated wire. I am using eight dry cells on the transmitter which is of course placed just in front of the resonating tube of the phonograph.—E. E. P., California.

One of the first requirements for producing a satisfactory system of transmitting speech or music over a telephone line from a phonograph is that you obtain a transmitter which will stand a large volume of current. Ordinary transmitters are built to carry the current which may be obtained from three or four dry cells connected in series. This will give you a current of possibly one-half ampere. If with this quantity of current you combine an induction coil wound in a suitable manner, then you should obtain fairly good results from an ordinary local battery transmitter if you connect the transmitter direct to the phonograph by means of a tube, such as is used in connection with phonographs when producing a record. The use of a tube concentrates all vibrations on the diaphragm of the transmitter and very satisfactory results may be obtained, although the articulation is not always of the best. We suggest that you communicate with some of our advertisers of telephone appliances and they will undoubtedly recommend that you purchase a special transmitter suitable for carrying somewhere between one and two amperes of current. They will also recommend special induction coils for the transmitting end, and it is always best to have a very powerful telephone receiver at the receiving end of the line.

Query 1—Please inform me what causes a common battery solid back type transmitter to be noisy, producing a crackling, grating sound, and how may it be remedied? No. 2—How may cross talk be located when it is present in a magneto switchboard and appears to be between the board and the outside terminals? What kind of a test can there be made for locating the trouble? No. 3—Which circuit will give the best transmission? A twisted pair, say of No. 12 rubber covered wire or a straight copper wire running, say, for a distance of 15 miles? The copper wire also being No. 12. Which circuit will talk best or will there be any difference? No. 4—When changing from 100 volts alternating to a 4 party harmonic converter system does it necessitate any better insulated cable? Does it call for the tip and sleeve being straight throughout the cable?—A. S., Pennsylvania.

No. 1.—Common battery transmitters always contain at least 2 contact surfaces in the microphone movement. Generally one of these surfaces is fixed and the other movable, and between the two electrodes we have the granulated carbon. When there is an insufficient amount of carbon granules in the microphone cup there is quite a resistance between the two electrodes and when resistance is present the carbon granules will gradually heat up, and when the current is sufficiently high you have the "frying" noise. The remedy, as a rule, consists in adjusting the electrodes so that they set closer together, and if this does not overcome the difficulty or overcomes it at the expense of satisfactory transmission, more carbon granules should be placed into the cup so as to fill up the cup to a sufficient point where the current is carried by the carbon granules without causing an arcing between the separate granules. It may be added that it is very important that you communicate with the manufacturers of the transmitter. They undoubtedly will be able to give you exact instructions as to the handling of the instrument. If you will advise as to the exact type of transmitter you are using, TELEPHONY may be able to give you more definite information.

No. 2.—You ask how cross-talk may be located between the switchboard and the terminal box. The best way is to disconnect from your switchboard all such lines as are giving you trouble. Then make a test for cross-talk with the switchboard left out of circuit. If you find the cross-talk present, go to your terminal box and disconnect the wiring between the switchboard and the terminal box. Now test for cross-talk towards the outside lines. If you find the trouble cleared, you of course have located it between the switchboard and the terminal box, and if you find it there, advise what kind of cables you are using; how insulated, whether the cable is subjected to moisture, and whether you are using metallic or common return circuits. Upon receipt of this advice we shall be pleased to give you more definite information.

No. 3.—The closer a pair of wires are to each other the more difficult it will be to transmit telephone currents over them. Obviously a twisted pair of wires will not talk as well as an equal length of two wires not twisted, but separated from each other a considerable distance.

No. 4.—You do not say anything about the voltage of the four-party harmonic converter currents. Some systems use up the 150 volts, and it is said that the insulation of lines and cables generally requires attention when such systems are installed, for if any unbalancing exists in different cable conductors, the higher frequencies of the currents are certain to find the weak spots and telephone users know that they have been found through hearing the characteristic hum of the different frequencies as such currents are being projected over the line for signaling purposes. Your question regarding tip and sleeve being straight throughout the cable is not understood. You, of course, appreciate that if you are operating common return lines and you endeavor to use the four-party harmonic system, a simple trial of the system will produce effects on the remaining common return lines which you will not easily forget.

We are about to install in our town an electric light plant and as we have a few country lines that are grounded circuits, we should like to know how we can lessen the induction from the lighting circuits on the telephone lines. If we install a No. 10 copper wire to the extreme end of the lighting circuit and put it on a good ground connection and connect our grounded lines to

this common return wire running in the same direction, will it be of any benefit in lessening the noise from the lighting circuit?—W. T. C., Illinois.

You fail to state what kind of a current you are going to use on your lightning circuits, but there is no question as to the advisability of running a common return lead to a point outside of the reach of the lighting circuit. The only point you must guard against is that you produce a first-class ground and that you carry the common return lead out far enough so as to be beyond the ground terminal (if there be such) of the lighting circuit. In other words, running this common return wire is the only alternate way (besides making the circuits metallic) for relieving the noise on your lines.

We have a telephone on grounded line, the third out from exchange that at times the bell does not ring; other times only a tinkling ring and sometimes rings good and clear; use four bar generators and 1,600 ohm ringers. This telephone is out sixteen miles and can ring the other end of line thirty-five miles out without any trouble. Had thought it might be in the ringer movement and changed it, then put in another phone, but it works no better. Thought possibly it might be in the ground and have run a ground wire to the well but no improvement. What can you suggest to remedy the fault?—E. B. S., Wyoming.

The effects which you complain of appear to indicate that there is something in the line circuit which prevents your bell from receiving the proper amount of current. It may be possible that you have a high resistance extension bell connected in series with the line and the telephone, where it should of course be connected in bridge with the telephone. Another probable cause of the difficulty is that one of the telephones connected to the line is not equipped with a suitably wound ringer. You may have a series bell connected at the end of the line. This would cause your trouble. It is suggested that you carefully examine into this question by having the telephone disconnected from the line, one after the other, leaving the defective instrument cut in. Then if you will signal the defective telephone at such times as the other instruments are cut off, you should be able to locate the telephone which is causing the trouble.

It is assumed that you have carefully examined all connections between the line and ground and that you are certain there are no loose contacts. A loose contact would produce the trouble complained of. Do not depend on a twisted joint, but take it apart, clean the wires, and thus assure yourself that the trouble is not due to the poor contact.

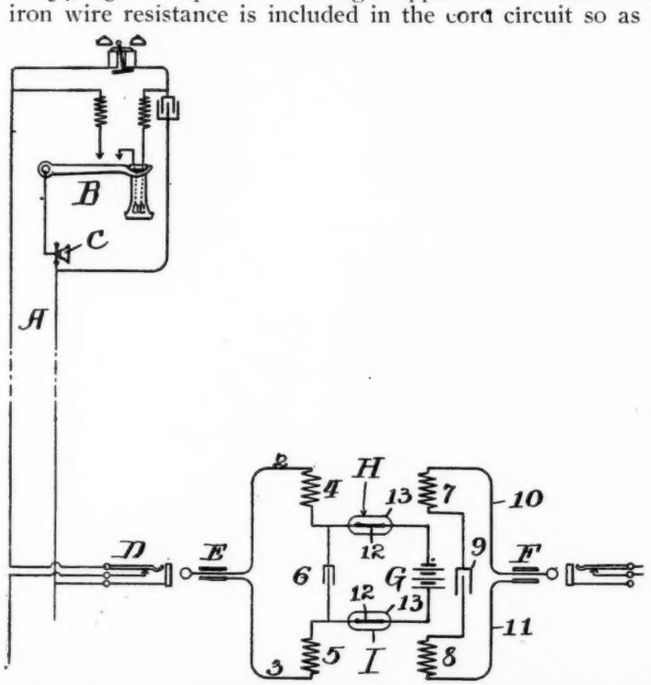
DIGEST OF TELEPHONE PATENTS

By Edward E. Clement

854,025. Telephone Transmitter. Browne. This transmitter is similar to the White in type, and is wired so that instead of current passing from the front to the back electrode in the direction of pressure it passes transverse to the direction of pressure. Patent assigned to John Abbott of Winchester, Mass.

854,164. Automatic Switch for Telephone Installation. Hildebrand. A peculiar arrangement of automatic switches at the central station which are controlled by the called and the calling subscriber enables the calling subscriber to obtain a thorough talking circuit. Patent unassigned.

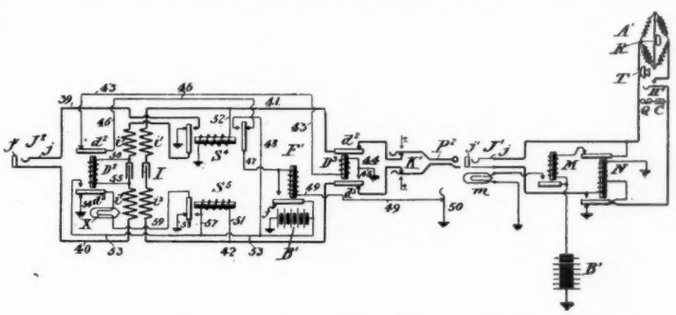
854,203. Telephone Exchange Apparatus. Enochs. An iron wire resistance is included in the cord circuit so as to



automatically compensate or balance the system for long or short lines. Patent assigned to Vote-Berger Company.

854,204. Telephone Exchange Apparatus. Enochs. In this instance the compensating resistance is included in series with the line lamp and the line contact of the jack, so as to regulate the voltage across the lamp. Patent assigned to Vote-Berger Company.

854,279. Telephone Exchange System. Dean. This system employs means which enables the subscriber to control the connective circuit and make the same discontinuous for



operative purposes without dissociating or disconnecting the plugs from their line jacks. Patent assigned to The Dean Electric Company.

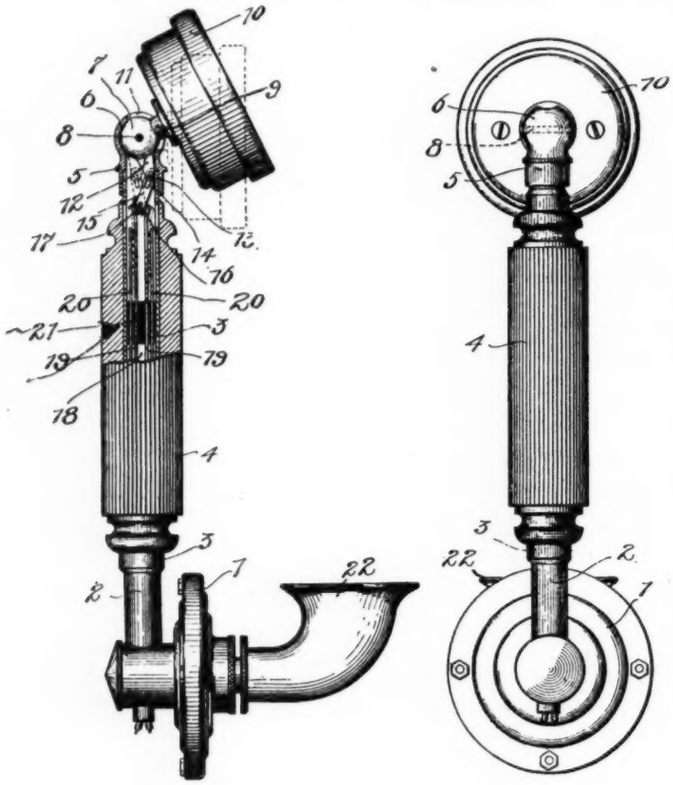
854,337. Trunk Line Telephone System. Dean. The trunk of this system is so wired that the A operator may signal direct to the called subscriber who may signal back for disconnection to the A operator. Patent assigned to the Kellogg Switchboard and Supply Company.

854,472. Sanitary Attachment for Telephone Transmitters. Dolson. A pair of spring clips are stamped out of a single piece of material and engage the mouthpiece of the transmitter. Paper is carried by a cylindrical extension of the body from which the clips are formed and may be pulled down over the mouthpiece and torn off as desired. Patent unassigned.

854,552. Telephone Switch. Alsobrook. The terminals of the line conductors are connected with the line by a line switch at the stations, a telephone switch and a supplemental switch used in connection therewith is so arranged that the

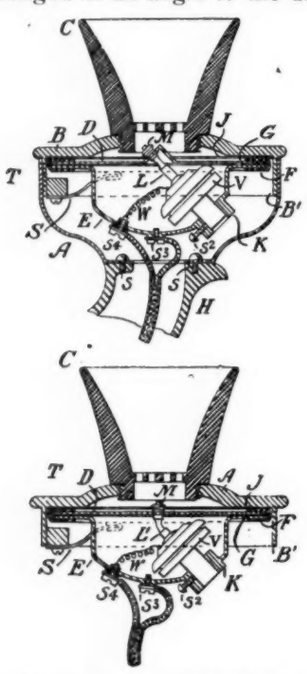
line may be restored therethrough when the line switch is inadvertently left open. Patent unassigned.

854,439. Portable Combination Telephone Set. Stromberg. This is a combined telephone and transmitter having a connecting handle in which is located a switch controlled by the operator when the receiver is placed against the ear.



Patent assigned to the Stromberg-Carlson Telephone Manufacturing Company.

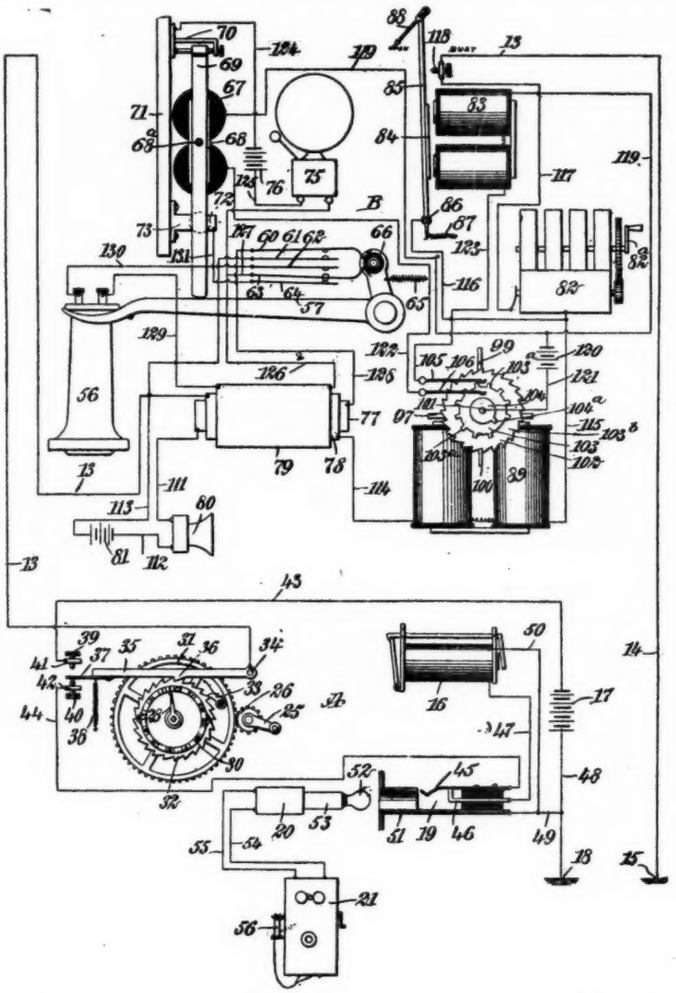
855,394. Telephone. Falk. The carbon button of this transmitter is arranged at an angle to the diaphragm. Pat-



ent assigned to the American Telephone and Telegraph Company.

854,830. Call Register for Telephone Systems. Manson. This call register is located directly in the transmitter casing and the lever which operates the sounding reed also operates a Veeder counter. The sounding reed is dampened in the backward movement of the lever so as to prevent false signals. Patent assigned to the Dean Electric Company.

854,543. Party-Line Telephone System. Terhune, Eidson and Huston. This is a lock-out system with combined



toll registering mechanism. The busy indicator mechanism short circuits the generator when the line is busy. Patent unassigned.

855,117. Apparatus for Testing Telephone Wires. Miller and Murray. This is a lineman's testing set having receiver and transmitter jacks. The receiver jack is connected in series with the secondary induction coil and a controlling switch and the transmitter jack is included in a local circuit with the primary of the induction coil. Patent unassigned.

855,168. Signaling Key. Forsberg and Birsfield. This is a complicated structure which is adapted to be used in connection with large party lines using code signals. When set the key will automatically act to transmit any desired signal or code of short or long rings. Patent assigned to the Western Electric Company.

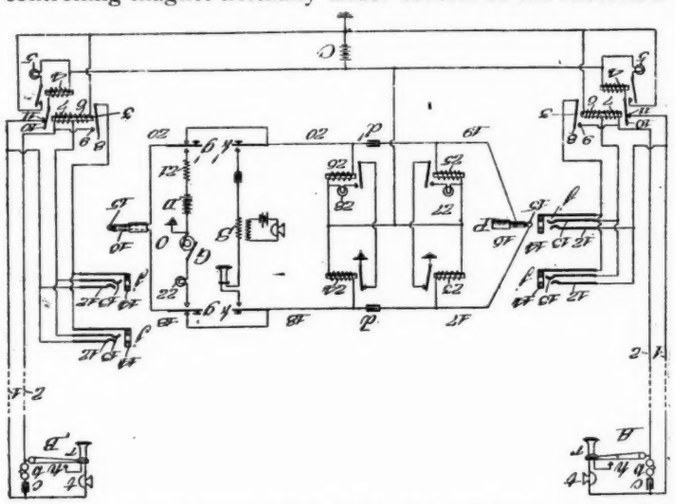
855,391. Telephone Switchboard. Dosbaugh. Instead of using plugs on this switchboard the operator uses a plurality of lever operated contact devices and cross-bar connections with operating magnets. Patent unassigned.

855,395. Telephone Transmitter. Falk. This is identical with the above but the claims are directed to the transmitter instead of to the combination set. Patent assigned to the American Telephone and Telegraph Company.

855,546. Telephone Exchange System. Webster. In

this system the spring jacks or switching terminals at central are permanently connected with the line and the circuits are so arranged and controlled by the cut-off relay that the circuit of the line limbs is not interrupted upon the insertion of an answering plug in response to the calling signal. Patent assigned to Milo G. Kellogg, of Chicago.

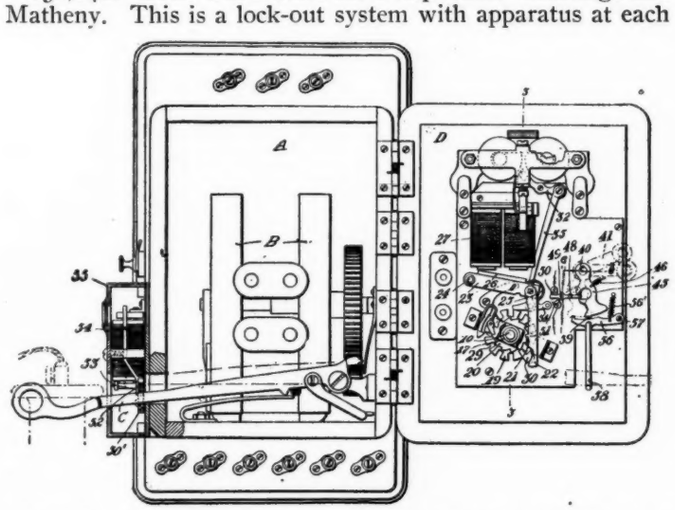
855,545. Telephone Exchange System. Webster. In this invention a central exchange is provided with a signal controlling magnet normally under control of the subscriber



whereby he may cause the display of a calling signal and a relay having two differential windings adapted when energized to render inoperative the substation control of the calling signal. Three part jacks and two part plugs are used. Patent assigned to Milo G. Kellogg, of Chicago, Illinois.

855,911. Telephone Receiver. Turner. The coils of this receiver have a plurality of leads tapped therefrom so as to enable the sensitiveness of the instrument to be regulated. It is especially adapted for different degrees of deafness. Patent assigned to the General Acoustic Company of New York.

856,146. Lock-Out Device for Telephones. Hastings and Matheny. This is a lock-out system with apparatus at each



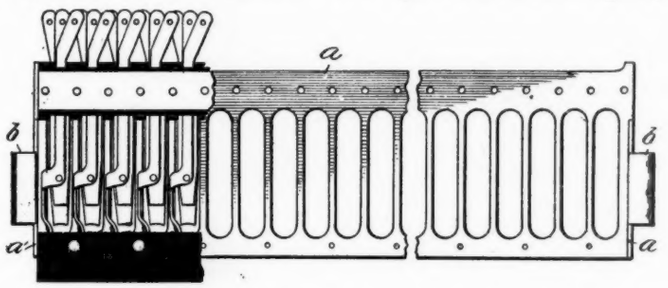
sub-station operating under control of the central office operator to lock the bell-clappers of sub-stations which are not in use upon the party lines. Patent unassigned.

856,260. Telephone Apparatus. Kaisling. This is a telephone wall set with the condenser secured to the back plate and with a switchhook and contact spring supporting bridge extending over the condenser and carrying the induction coil. The ringer is mounted on the front of the box with a clapper rod projecting therethrough. Patent assigned to the Stromberg-Carlson Telephone Manufacturing Company.

856,386. Automatic Calling Device. Beck. This is a circuit controller for automatic calling devices of automatic switches and comprises a manually set controlling ratchet with electromagnetic mechanism to operate it after being set. The manually operated means are rendered inoperative to affect the controller until after the controller has completed its operation. Patent assigned to the Western Electric Company.

856,570. Telephone System. Cook and Nolen. This is a telephone system equipped with electro-thermal switches. Each switch involves merely a heat concentrating member and an expansible medium together with one or more contacts. Said Nolen assignor to said Cook.

856,955. Spring Jack Mounting Plate. Hibbard. This is a strip of jacks mounted upon a plate which has a clamping lug at each end thereof. The lugs are formed integrally



with the ends of the plate. Patent assigned to the Western Electric Company.

857,079. Multiplex Telephony. Leblanc. The method which is employed in this system consists in modifying in accordance with sound waves single phase alternating currents of a different frequency, combining at a distant point the currents thus produced with an alternating current of the same frequency and translating the resultant currents into sound waves. Patent assigned to the Westinghouse Electric Company.

857,480. Telephone System. Neimann. This is a rural magneto system and employs a low wound grounded signal drop at the telephone office or exchange so that current of comparatively low value will insure the operation of the drop under all conditions. Patent unassigned.

John T. Huetter will build the Home Telephone Company building in Spokane, where the contract for $60,000 was awarded recently. This calls for the construction of the building proper, which must be completed by November 1. Excavation for the building was completed several weeks ago. The company has also put up a number of poles in the city and laid underground wires to be in readiness to put its plant in operation as soon as the exchange is completed. Cyrus Happy, vice-president of the Home Telephone Company of Spokane, declares there is no truth in the report that the corporation will be bought out or absorbed by the Pacific States (Bell) Telephone Company. He added: "The ordinance covering the granting of a franchise to the company by the city council provides that it cannot be sold to any corporation, company or individual. The franchise even prevents us from combining with any other company regarding rental and toll prices."

A story illustrating the many impossible requests made of telephone girls is one told of a woman who was going out shopping for a few hours. She put her baby to sleep in its carriage, and, taking down the telephone receiver, placed it beside the sleeping child. Then she notified central of the arrangement and asked her to sing to the baby if it woke up and cried.

REPORT OF THE STATES

One of the Most Interesting Features of the Recent International Convention

ON THE roll call of states President Hoge asked for a report from Canada, which was furnished by A. Hoover, president of the Independent Telephone Association of Canada, who gave an interesting account of the progress of the movement in the Dominion. The victory won by the anti-Bell forces in the recent municipal elections forecasts rapid strides in the telephonic development of Canada.

"On behalf of the Canadian Independent Telephone Association I beg to submit the secretary's report, which was prepared for our last annual convention:

Number of absolutely Independent or non-Bell companies and private systems	73
Number of shareholders	3,248
Number of subscribers 15th August, 1905	6,427
Number of subscribers 15th August, 1906	12,073
Increase in one year	5,646
Capital invested	$850,000

"The above does not include the Central Telephone Company of New Brunswick. The annual report of the Bell Company of Canada shows that on the 31st of December, 1905, it had 78,195 subscribers and an increase in 1905 of 12,035.

"It has been a somewhat difficult matter to obtain full information and figures regarding Independent telephone systems in Canada, covering as it does half a continent, and it at first being very difficult to know with whom to enter into communication. By means of writing those known to be in sympathy with the movement and who are refusing to affiliate with the monopolistic company we have come into touch with about 90 Independent telephone companies, privately owned lines and municipal systems. The figures given above are taken from the reports sent direct to the secretary by the officers of the different companies and municipalities and owners and are thoroughly reliable. There are a large number of other Independent systems, especially in the west and Nova Scotia, knowledge of whom was received so late that reports have not yet been returned, and the figures given are considerably below the actual number. If any person knows of any new company starting or any independent person about to start an Independent telephone system, however small, and will notify the secretary, it will be doing a great service to the association and Independent interests, as well as to those who are about to invest in an Independent telephone system.

"The statistics given above do not include any company or person having connection in any form with the Bell Telephone Company of Canada or its subsidiary companies, with the exception of one private line in Quebec having one telephone and another line of fifty telephones which connects with both Bell and Independent lines. Reports have been received since the foregoing statistics were compiled which have Bell connection.

"To the Bellechase Company of Quebec, of which Dr. Demers is the manager, belongs the credit of having made the greatest increase during the year. To the province of Ontario belongs the credit of having made the most rapid advance of any province, the increase in that province for the year being nearly 3,700. The reports have been received from four municipal systems only.

"In view of the facts that more than half of the Ontario companies are only a few months old, that there had been no telephones manufactured in Canada and equipment had to pay a duty of 25 per cent in addition to other burdens; that there has been little or no intercommunication except with local companies; that Independents have to compete against the most strongly entrenched monopolies in Canada and that development has been confined largely to the rural parts, the Bell Company with few exceptions (among which are Sherbrooke, Levis, Brantford, Peterboro, Ingersoll and Toronto Junction) having the towns and cities to itself, shows the force of the movement for competition in telephony just begun, and for the first time organized. Since this report was prepared there has been a development of approximately 25 per cent. Additional strong companies, well organized with six to seven hundred telephones, have been established at a number of important places, and it is very gratifying to be able to announce that a submarine cable has been laid by the Provincial Long Distance Telephone Company across the Niagara river, connecting the United States and Canada, so that we are now able to talk to the people of this country.

"I might also state that there is a connection in the northwest between Sherbrooke, Quebec and the New England states. Mr. Dagger, the provincial telephone expert of Winnipeg, Manitoba, is here to tell you about conditions in the northwest, so that I will not attempt to cover that section in my remarks, further than to say that the development there is helping the entire movement in all parts of the country. As president of the Canadian association I wish to assure the gentlemen of this convention that they may depend upon our hearty support in all measures adopted for the good of the common cause. The principles of the movement we represent are of more than sectional importance and it behooves us all to work together for the advancement of all of the interests of this grand industry. You may count upon Canada, gentlemen, to do her part in so far as she is able in carrying on the work that has been undertaken."

D. S. Parker, of Pomona, California, who built the exchange at that city, responded when California was called and gave an interesting account of Independent development in that state.

"The emancipation of the Pacific coast from the domination of the Bell monopoly dates back four years, when that energetic and well-known telephone man, Mr. F. F. Graves, commenced the operation of the Los Angeles plant. The development and progress of the business has been one triumphant march all over Southern California until now, like Alexander of old, we have no more territory to conquer. I present figures representing a territory approximately one hundred miles square, operating at the present time forty-two exchanges in thirty-nine towns, with a total of 54,000 home telephones. The Bell Company operates in the same district approximately 43,700 telephones. The total population served is estimated at 450,000, making the ratio of eight and one-third people to one Home telephone—the ratio of the Home and Bell companies combined being four and one-half persons to each telephone employed.

"In 80 per cent of the Independent exchanges the average rate is considerably higher than the Bell rates. I present the following figures as showing the high state of telephone development on the Pacific coast, notably Los Angeles having nearly 60,000 telephones in service by both Independent and Bell companies, using a telephone to each four persons, while the little city of Pomona, a Los Angeles suburb, with a population of 7,500, has over 2,000 Independent telephones.

"In the following towns the proportion of Independent to Bell telephones is high: Whittier, 850 Home to 15 Bell; Downey, 175 Home to 4 Bell; Compton, 400 Home to 2 Bell; San Fernando, 125 Home to 1 Bell; Covina, 700 Home to 3 Bell; Monrovia, 655 Home to 40 Bell; Pomona, 2,000 Home to 150 Bell.

"In addition to the foregoing figures I have to report the completion of plants at Oakland and Berkeley, which if added to our list would swell the totals considerably. San Francisco has granted a franchise to the Independent interests and construction is proceeding rapidly in that city. The Independent long distance connections are very complete and connect all local plants in Southern California."

Speaking for Kansas, President W. H. Nelson of the state association said: "We now have a good strong working state association organized along the lines of the Ohio state association. Ninety-five Independent telephone companies constitute our membership. We have 44,200 telephones in operation against the Bell company's 6,443. From the best information obtainable the situation stands all in favor of the Independents."

For Illinois' State Secretary C. B. Cheadle reported:

"I am very glad indeed to report, Mr. Chairman and gentlemen, that Illinois has had a most successful year during the last twelve months that has elapsed since our last meeting. We have an organization which now promises 100,000 units. There is in the state not less than 200,000 Independent telephones. Our state association a few weeks ago, on the 14th and 15th of May, held the largest and best convention ever held in the state. There were 254 members enrolled. We had a very unique feature at that convention, I think one which will commend itself to the careful consideration of telephone men generally. We had an enrollment of more than fifty of the operators of the state, the young ladies who come into direct daily personal contact with the patrons of the different companies. We had a most competent instructor, the chief operator of one of the principal cities of the state, Miss Barnes of Springfield, who conducted a school of instruction. This has received commendation from all over the state as being a most unique and helpful feature. Our purpose was to make it a thoroughly practical convention, to get away from oratory, red fire and skyrockets and down to actual business. That we were successful I think is conceded by all that were present. Illinois has not during the past year been seriously interested in questions relating to Bell telephone companies. There is no hobnobbing with the Bell. We have not seriously considered toll line contracts or working agreements of any kind with the Bell telephone companies. The Independent people generally are in a very good frame of mind and have greater and more permanent and substantial belief in the absolute justice of their cause than ever."

Speaking for Iowa, State Secretary C. C. Deering said: "The Iowa Independent telephone business is growing and our exchanges are increasing in size, both of rural and city subscribers, and new toll lines are being built. We have no large centers of population and the Independent field, as many of you know, is covered by a very large number of small companies. Last year 2,500 companies reported to the state for taxation. Many of these reporting were very small companies. The number was so large that it was said that every subscriber constituted a telephone company of its own. Our state association has had a good growth and will continue to grow. Many of the smaller companies have not been interested in the association work in the past, but as time goes on more of them will find it to their interest to join hands with us. Owing to the large number of small companies not members of our association our association membership is not as large. compared to the total number of telephones in use, as in many other states. We have 70,000 units represented in our association. At the time of the last assessment by the International association our paying membership was a little less than 60,000 and on that we paid to the association $293.00, which at the time was about 1½ cent per unit."

When Kentucky was called President M. B. Overly responded. He said: "Mr. Chairman and gentlemen, our secretary handed in a written report, but I do not see him around and I will give a short verbal report. We have at present about 150 members in our association and you know a man in Kentucky represents three or four in Ohio. We have about twenty-five people from Kentucky at this convention, which we consider is a very good thing, not only for us but for those who attend. We have in round numbers 50,000 Independent telephones in Kentucky and about the same number of Bell. The state is being very well covered and the western section, west of Louisville, is being practically all built. The companies are all in good shape and are doing well. New toll lines are being extended every day."

E. B. Fisher of Grand Rapids responded for Michigan. He said that at the March convention the state was better organized than ever before. There are now 428 Independent exchanges in the lower peninsula and 661 toll stations, numbering 1,089 all told. There are 70,000 subscribers reported and Mr. Fisher stated that there are at least 90,000 users of Independent telephones in that section, as 120 exchanges have not yet sent in detailed reports. There are 9,000 miles of long distance lines, over half of which is constructed of copper wire. Speaking of the Detroit situation, Mr. Fisher said the new Home company would begin operations October 1 with at least 15,000 subscribers. The construction of a state long distance company covering all Michigan Independent lines and giving communication with adjoining states will be of great advantage to the Michigan interests as well as the Independent movement generally. Mr. Fisher added a word of commendation for the state traffic association and also referred to the Michigan state managers' association, which was organized during the last year and is proving a valuable auxiliary. The speaker paid a high tribute to the courage of the men who dared to combat the Bell in Detroit and invest several millions of dollars in the face of the fact that the Bell company was managed and controlled by men who represented the largest business interests of the state.

A. C. Lindemuth reported for Indiana and submitted a statement of the situation in that state which elicited great applause. President Lindemuth said:

"The Independent telephone movement in Indiana is more firmly entrenched today than at any previous time in its history. In fact it has passed the period when it can properly be called a 'movement,' for it has become one of the fixed factors in the commercial and social life of the Hoosier state. Any review of our cause in Indiana during the past year must take into consideration three factors: Its independency, its development and its financial standing.

"The Independents were never more independent in this state than they are today. To the Indiana Independent Telephone Association came the tentative proposition from the telephone trust before an amalgamation of the opposing telephone forces. Our state has been deluged by tracts and newspaper articles arguing and pleading with both our subscribers and the public for a single telephone system which the trust freely admits can only be attained by the Independents taking on the Bell toll line connection. Our subscribers have been importuned by personal letters to use their influence with their officers and managers to compel the Independents to accept the unifying propositions of the defeated monopoly.

"Notwithstanding all this the Independents having remained true to their colors and refused to enter into any alliance as an organization or as individual companies

which does not include the entire abandonment of the local exchange field by the Bell, equal rights in the toll line business and fair treatment of the Independents of neighboring states. In the meantime several sub-licensed companies have severed their connection with the Bell and are now connecting with the Independents exclusively.

"As to development, there is but little territory in Indiana unoccupied by the Independents. In forty out of the ninety-two counties of the state they have little or no opposition. The Independents during the past year have devoted their energies chiefly to improving and extending their exchanges and toll lines already established, there having been an increase of 10.421 subscribers and 1,200 circuit miles of toll lines, requiring an additional investment, according to the tax reports, of $1,139,996.00.

"Several of the larger cities, including Terre Haute, La Fayette, Richland, Wabash and Rushville, having erected new buildings, installed new switchboards, instruments and outside equipment, or have the systems now being installed. Since the installation of our new copper metallic toll lines from South Bend to Indianapolis and from Fort Wayne to Indianapolis it is now possible for any Independent company to have commercial toll line service with every other Independent company in the state.

"The earnings of the Independent companies of the state show a remarkable increase during the year. While the added investment is only 8 per cent, the gross earnings amount to $3,270,114.00—and the increase of 16½ per cent, or $467,550.00, indicates that the Independent properties are better managed. This increase of earning power is due both to better business methods and increase in rates which has been secured by a number of companies. Out of the 385 Independent companies in the state, the only one which has gone into liquidation during the past year has been a sub-licensee of the Bell. There is no method of learning what per cent of our securities are held by local financial institutions, but with better business methods and better rates has come increased confidence in our securities on the part of our local bankers, and it is safe to say that they hold as large a per cent of our telephone securities as those of any other business no older and purely local in character.

"But our financial backing does not come from banks altogether. It comes from the people—from the 15,000 stockholders who own our properties, including the banker, the broker, the merchant, the mechanic, the lawyer, the physician, the farmer and all of the professions, trades and occupations represented by the common people. A business whose financial foundation is laid in every community of the state and supported by the people in every walk of life needs not the financial backing of Wall street to be a success, so much as it needs conservative, good business methods in its management. This we are attaining in Indiana.

"The Indiana Independent Telephone Association is in fine form and doing its work. Not a member withdrawing during the year, and with an increase of twenty-seven new members, we now have a total membership of 145 companies, representing nine-tenths of the Independent telephone investment in the state. Dependent entirely upon assessment from member companies, we have met all obligations promptly and closed the year with a balance in the treasury. We have had an attendance of over 300 at our recent annual meeting, which almost rivaled this national meeting in importance.

"As a brief summary, suffice it to say that Indiana closes its best year in the brief history of the Independent movement and is successfully solving the problem of universal telephone service for all the people at reasonable rates."

When Arkansas was called A. E. Boqua responded and said: "We can report considerable progress in telephone development during the past year. Our association is only a little over one year old, but in that one year we have accomplished results which insure us a substantial future. We have in the state of Arkansas 35,000 Independent telephones which are ready to connect with the long-distance lines as soon as the lines are ready. A large number of these are connected with Bell companies. When our long-distance lines are completed we shall expect each of these exchanges to drop the Bell. We expect next year to tell you that we have 40,000 against the Bell's 12,000. In the matter of toll-line construction we have laws in Arkansas which allow us to use the railway lines for our toll lines. In the matter of exchange propositions we have some very good openings for anyone who has money with which to build."

Speaking for Nebraska, Secretary R. E. Matteson said: "We have 90,000 Independent telephones in the state of Nebraska and over 300 Independent companies. We have found that the state association and our clearing house are absolutely necessary. The association maintains an office in Lincoln and employs a traveling secretary and such additional help as is necessary. One of our most successful enterprises during the past year was to issue a state directory which resulted in considerable revenue from advertising. Nebraska is developing rapidly both in offices operated and in organization."

The following report from the Vermont and New Hampshire Association, forwarded by Secretary G. W. Buzzell, was read:

"It is with the deepest regret that I must announce that on account of ill health, I am unable to attend your convention this year. I assure you this is a distinct disappointment as I had expected to attend up to within the last few days to meet my brother Independent telephone men from all parts of the country and learn what they are doing. We are so far East that perhaps we may be unknown to many of you, but we feel we are, nevertheless, an important part of this great movement. Last year I learned a great deal which has been of much profit to all of our people.

"As to the telephone situation in the state represented by our association, I might state we are keeping pace with our competitor. Perhaps, the Independent people have not placed as many telephones in Vermont and New Hampshire during the last year as the other people, but we know the telephones they have installed are revenue earners. The Independent place no instruments without being reasonably sure of getting their money back, while on the other hand, our competitor has placed hundreds of telephones that will never even pay them interest on their investment and the greater part of these telephones will be displaced by Independent telephones in the future.

"The actions of our competitors would indicate that their sole purpose seems to be to wreck the Independent companies wherever they can, and this purpose seems to be reacting on them, and if there is not a hold-up to their reckless business methods, they will be sufferers to an even greater extent than they have been. They cannot keep up the methods they have used in the past when it is a well-known fact they are compelled to pay as high as 14 per cent on their borrowed money.

"We have the honor of having for our neighbor at a summer home T. N. Vail, the Bell's new president. He is a fine business man and we wish him better luck in financiering his company than his predecessor had. We see no reason why a Vermonter should not handle the A. T. & T. Company in a businesslike manner. We feel proud of the fact we have so bright a man in Vermont.

"Both Vermont and New Hampshire have recently granted Independent telephone companies franchises in several large towns which will be of great importance to us as soon as these towns are built. All we lack in Vermont and New Hampshire is trunk line connections with Boston and New York to enable us to successfully compete with our

competitors on long-distance work. Locally, we are more than able to compete with them now as we have more telephones and give better service than they do. During this season we will finish a trunk line from St. Johnsbury, Vt., to Laconia, N. H., which will complete our trunk line from Sherbrooke, P. Q., south to Laconia, being about one hundred and seventy miles.

"At the last session of the Vermont legislature, a law was passed giving all telephone companies equal rights in placing telephones in railroad stations throughout the state. The Independent people asked the Boston & Maine Railroad Company to grant this right and let them place telephones in the railroad stations on the same terms as the Bell telephones were placed there. This was refused on the ground that the railroad company had a contract with the Bell Telephone Company which forbid them allowing Independents to place telephones in their stations. We informed our attorney-general of the refusal of the railroad company to comply with the law and our state has brought suit against the Boston & Maine Railroad to compel them to show no discrimination. It is the common opinion that our competitor is paying the costs of the defense since they do not want the Independent companies' telephones in the stations. (Of course, if they can get money at such a low rate as 14 per cent there is no reason why they should not settle all these little bills.)

"Things are becoming very interesting up here. We have learned of several cases with the New England Telephone Company, the monopoly in our part of the country, where they have tried to dispose of certain counties to outside parties, or rather they form a new company and sell not to exceed 49 per cent of the stock then let the other fellow fight the Independents while they still own their plant. (This appears to us a good idea.)

"I wish to state right now for your information that all of the Independent companies in Vermont and New Hampshire are in first-class condition and are prospering financially, notwithstanding the report of ex-President Fish. There is no use of my taking any more of your valuable time, gentlemen, as it goes without saying that what is true as regards the Independent movement in one place is true of nearly every other place."

When Ohio was called, Frank L. Beam, president of the state association, responded as follows:

"Down in Ohio it is a very common expression to say I am from Missouri and you must show me. In regard to Kentucky, I want to say to the gentlemen here that the president of the Kentucky association is well known in Ohio, and any statements which he may make will be taken with a grain of salt up in Ohio. Ohio, however, is one of the best developed states in the United States. We have eighty-eight counties in the state and everyone is developed with the exception of Hamilton county. We make up our reports by counties and make a comparison so that we may see just how strong we are in each county of the state. The Independents have 290,400 telephones in service against the opposition's 145,956. That includes the telephones the Bell has in operation in Hamilton county where there is no competition. We have 1,723 toll stations against their 861. We made a growth for the year from April 1, 1906, to April 1, 1907, of 42,096 telephones. In 1896 there were fewer than 45,000 telephones in service in Ohio. The reports show that there were about 294,000 telephones in the United States in 1896. To-day we have operating in Ohio by the Independents as many telephones as the opposition had in the entire United States in 1896. I think this is probably due to the very thorough organization we have in the state. The first organization in Ohio took place April 29, 1894. At that time there were only one or two exchanges in the state. The national association, I think, was organized in 1897 in Detroit. We were organized about three years before the organization of the national association. Our annual meetings are looked forward to with considerable interest. Instead of having only the directors to hear the report we make a special feature to have every stockholder present to know the condition of the company and also to know what is being done in the adjoining counties, and in the state and in the Union. I know in my own town we have 290 stockholders, and we had at our annual meeting in April over 200 stockholders who came in to hear the report and to attend the banquet."

When Pennsylvania was called, Charles W. West spoke as follows: "The state of Pennsylvania has made a very strong gain in the telephone business, over 160,000 telephones being in use, 398 exchanges and 4,153 toll stations. There are very few points in the entire state that cannot be reached by an Independent line. S. P. Folsom, president of the Keystone Telephone Company, is here and can give you more facts and figures concerning the business in Philadelphia."

Mr. Folsom responded, saying: "Last year I made a few remarks about the telephone situation in eastern Pennsylvania, especially around Philadelphia and the companies operated by the Keystone Telephone Company of Philadelphia. Since our last meeting here, in our part of the country we have made some substantial progress each month. During the last year the Keystone company has increased about 4,200 and have laid fifteen miles of new subway. We find it advisable to place these wires underground. We are increasing the circuits on our toll lines and are building some new ones. I would advise giving the best service possible all the time."

S. S. Thayer, of Beaver Falls, Pa., said: "I represent a little piece of territory which telephone men who live in eastern Ohio and western Pennsylvania have been and will be most interested in. It lies twenty-five miles down the Ohio river from Pittsburg. Seven years ago when I was located in Columbiana county, Ohio, a party came to me and desired help in the Beaver Falls territory. He said they needed telephone service very much. I took him to Cleveland to see if someone there would help to get into that field, but we were unsuccessful in interesting anyone there. The Bell company were there very strong and they boasted that Beaver Falls gives the greatest revenue of any place of its size in the whole world. Two years ago I resolved to go down there myself and live with the Bell telephone company and stay right there with them. I applied for a franchise and was turned down. The next day I applied again and was turned down. The next day I applied again and secured what I was after. I kept at it in one place and another and after repeatedly being turned down secured nearly all that I set out to get, and to-day we have things as well organized as could be desired. Seven or eight years ago we did not know as much about the telephone situation as we do to-day."

When Virginia was called the announcement was made that B. L. Fisher, representing that state, had sent in his report with regrets that he could not attend personally. The report was read by the secretary which stated in brief that the state has between 25,000 and 30,000 telephones in service and 100 Independent companies.

Mr. J. Walter Barnes spoke for West Virginia, and said: "We can show very satisfactory results during the past year having approximately 43,000 Independent telephones in service against the Bell's 9,470; forty-four exchanges and 196 toll line exchanges. Long-distance toll lines are being built rapidly by the Independents."

For Missouri, Houck McHenry reported:

"We have made considerable progress in Missouri during the past year. While there have been some defections from the Independent ranks we have more than held our own. At St. Louis and Kansas City the Independent companies are showing wonderful growth, and in a few years we expect it will be a case of 'also ran' with their com-

petitors. The Independent company at St. Joseph has been taken over by that intrepid, indomitable old war horse, Theodore Gary, and is being rejuvenated and rehabilitated, and will soon be ready to carry the war into the enemy's camp. Springfield is safely placed in Independent hands. In the smaller towns and villages, with a few exceptions, our growth has been very satisfactory. We have at the present time in the neighborhood of 160,000 Independent telephones in service in Missouri, and without a single exception to my knowledge every Independent company in the state is growing. In my home town, Jefferson City, our company has a few less than 1,100 telephones in service, and our competitor less than 20. In the past in Missouri we have had the same trouble with the farmer bug that he is now having with the 'green bug.' The chief characteristics of the two bugs are very much the same, they both gobble up everything in sight. They differ in that the green bug is with us for only a short time, and he doesn't hurt the local telephone business. But seriously, our farmer troubles are becoming a thing of the past. He is not only the bone of contention to-day, but will be the balance of power if we are not very careful. Missouri in the person of its representatives sends greeting to the International association now assembled, and assures you that our bridges are burned behind us and while the enemy is not always in front of us, we will always be found in the front ranks fighting for the people and Independent telephony."

Speaking for Texas, J. B. Earle, of Waco, reported as follows:

"Texas affords a particularly fine field for telephone investments. Construction cost is relatively cheap; climatic conditions favor a low maintenance charge.

"Since our last convention, our development has been along the line of enlarging our exchanges and development of the villages and rural lines. Hillsboro, a town of about 10,000, is one of the exceptions. There an Independent company has finished a plant as good as the best, as well built as the entire county of Hill. This adjoins McLennan county, and the Waco property, which is the pioneer company, and these two counties are won to the Independents.

"Houston, one of our principal cities, is to install an up-to-date automatic plant which will materially strengthen the situation in south Texas. This is a city of about eighty thousand people. In Dallas, our principal city and the home of the South-West (Bell) Company, the Independents have failed to get a franchise, but only last week Dallas was put under our commission form of government, and we believe a reasonable franchise can be secured for the asking. In case of failure, we have the advantage of the initiative and referendum, and we are sure we can go before the people and procure this franchise on reasonable terms. As soon as some parties with the means want to undertake this plant, we will be able to give him such assistance as will, we believe, procure a franchise on fair and reasonable terms. Dallas built and Texas would be as thoroughly developed as some of our older states. Nowhere is local influence more appreciated than in Texas.

"Our state has a system of toll lines extending across from north to south. At least three of the toll line companies are at present buying copper to add other circuits for our next cotton season. Our cattle, grain and cotton crops must necessarily be handled over the long distance telephone. Both the Independents and the Bell company are overrun with calls and each company is building new circuits to accommodate the business.

"Our rates are good and unless one was familiar with our conditions he would not believe that there was such a volume of toll business.

"Just as our oldest companies were on a firm financial basis—had passed the experimental point—just when we were reaping the rewards we were so much entitled to, Independent telephony in Texas received the saddest blow in its history. I refer to the death of Judge J. E. Baynton, of Waco. He was the pioneer Independent telephone man in Texas. He was a man of great legal and literary attainments, one of our successful business men; a man of more sterling worth and character I never knew. He at all times stood for the right, and when the dark days came, when adversity threatened, it was to Judge Baynton we turned instinctively. It was he who saved the largest property in the state from falling into the hands of wreckers. It was he who fought our legal battles as well, and did more than any one man in our state to popularize the movement. He and I had helped to build and controlled more than one-half the Independent property in our state. Naturally I looked forward with much dread to having all these varions properties placed in the hands of one man.

"Our state association met in Ft. Worth in February on a hurried call on account of proposed legislation. We passed a resolution against physical connection with the Bell and appointed a committee to go to Austin to protest against the passage of this bill. The result will be handled in a paper I have on this subject. Our association also placed the dues at two and one-half cent per unit, which is being paid to the secretary. The prospects are now that 1907 will see great advances made by Independent telephony, while the Bell company is letting up in Texas as it is in your sections."

Following is the report made for Kansas:

"We now have a good, strong working state association, organized along the lines of the Ohio state association. Ninety-five Independent companies constitute the present membership, with several yet to become members. This membership includes all of the principal Independent operators in Kansas. Of this total membership seventy-five have made recent reports of a statistical nature showing a total of 44,702 telephones and operating 4,198 miles of toll lines, most of the latter being good metallic circuits. In the same territory the Bell and sub-licensee companies have but 6,343 telephones, but we have no report on the miles of toll lines operated by them.

"From the best information we have been able to secure the relative strength of the Independents and Bell in Kansas is about three to one in favor of the Independents. Considering the fact that the Bell has been operating in the state for the past twenty-five years and the Independents less than ten, we feel very proud and satisfied with our present conditions. For the past month we have had in the field a traveling secretary, and although the time has been short in which to determine the amount of good he will be able to do, we can readily see good results appearing from his work. In fact, we feel that the investment in his salary and traveling expenses will be money well spent.

"We look for a vast improvement in the Independent telephone interests of Kansas during the present year, and a general rallying of sub-licensee companies under our banner. It is very pleasing to us to learn that many of the sub-license companies are not under binding contracts for a definite time, but have only taken the Bell lines in their exchanges for toll connections and are ready to sever them as soon as they can secure Independent connections. Good toll lines are being built as rapidly as possible, and before the coming winter we hope to have all the principal cities connected with good Independent toll circuits.

"In my opinion the greatest enemy the Independents of Kansas have to contend with at the present time are the rural mutual companies. They have done more to retard the improvement of the exchanges in the smaller cities as well as the building of good toll lines than the Bell can ever do. We have faith to believe, however, that it is only a fad of the present day and will soon end and that the promoters of these 'something for nothing' schemes will learn sooner or later that the telephone business, the same as any other busi-

ness, must be conducted upon business principles. Our traveling secretary, in the time he has been at work, finds that many of these mutual companies have already realized that it requires capital and an income to keep their lines and exchanges in condition to give good service. Those are now ready to co-operate with the regular companies along business lines and pay something near what good service is worth. We, in Kansas, would be pleased to learn from the delegates present from other states, as to the best methods in which to handle this question and at the same time not incur the enmity of the mutuals. We want to retain their good will and eventually secure their business upon a basis that will be fair to all.

"Kansas has good, up-to-date Independent exchanges in all the principal cities. In Topeka, the Topeka Independent Telephone Company has recently rebuilt its exchange upon the most modern plans, and with a financial backing that can mean nothing but success. It has a central energy system laid underground in all the principal streets, with offices and operating rooms in a building constructed especially for that purpose and owned by the company. It has over 6,000 telephones now installed with about 600 on the waiting list. And the improvement at Topeka is but one instance among many others. The same could be said of Wichita, Hutchinson, Lawrence, Kansas City, Kans., and many other cities over the entire state.

"We are proud of the fact that we can announce these good reports from our state to the International Independent Telephone Association. We are proud of the fact that Kansas is to-day not far behind some of our more energetic of the eastern states with a live body of men pushing her toward one of the 'top notches' in the future of Independent Telephony."

ASSOCIATION WORK IN 1906-07

Report of the International Secretary Submitted at the Chicago Convention

By J. A. Harney

THE YEAR'S WORK.

ALL necessary changes have been made to bring our card record of Independent companies up to date and we have increased this list by 2,642, so that it contains names of 10,042 companies, all of which are strictly Independent, according to the best information obtainable. We have recently secured a list of over 10,000 cities and towns having Independent service, with the name of company at each place, also considerable information regarding the organization of new Independent companies. Neither the list nor the other information has been checked against our card record and both doubtless contain names not included in this record, which, when added, will probably increase the total to not less than 12,000 companies.

The association is in a peculiarly advantageous position for securing information of this nature, and the list may justly be considered one of its most valuable assets, well worth any reasonable expenditure to keep it constantly complete and up to date.

1906 CONVENTION PROCEEDINGS.

Acting upon the instructions of the last convention, 5,000 copies of convention proceedings were printed. These were ready for distribution about October 30. No efforts were spared to make this report as useful as possible to all branches of the Independent industry. Besides the verbatim record of the daily sessions, it contains a full report of the banquet, copies of all papers and committee reports, list of all association officers and committees, alphabetical list by states of all atending the convention, constitution and plan of organization of the association, with an appendix of important data brought out in the discussion, reports, papers, etc., classified for ready reference under states or subjects, everything being indexed so that it may be quickly located.

To insure the widest possible distribution of these books the price was fixed at twenty-five cents for single copies, post paid, with a special price of twenty-two and one-half cents in hundred lots, which was merely sufficient to cover the cost of publication. A circular notice was sent to all of the Independent companies at that time on our list, approximating 8,500, and also to all who registered at the convention, amounting to 750. Only 912 copies have been disposed of to date. This is to be regretted, because the report as a whole is a complete and authentic history of one of the most remarkable conventions ever held by the Independent interests and is deserving of a place on the desk or in the library of every one interested in any way in the Independent industry. The Indiana association purchased a copy for each of its members, and a number of the larger companies who have bought quantities of the book to be used in interesting financiers and investors in their properties recommend it as one of the best documents that was ever prepared for this purpose.

The association is anxious to dispose of the copies it has on hand and believes if the value of this book is understood there will be no difficulty in doing so. For the benefit of all who may wish to make up for lost opportunities we have arranged to have these books on sale during the convention at a nominal price of ten cents each.

COPIES OF CONSTITUTION.

Besides the proceedings the last convention instructed the association to publish the constitution separately in book form. This was done, 1,000 copies being printed in the form of a small booklet and distributed free among the officers of the various associations and others desiring same.

PERMANENT COMMITTEES

In accordance with recommendations of the last convention, shortly after adjournment three members of the committee on Standard Operating Rules and Regulations were appointed as a permanent committee on this subject, to continue their work during the year, and a permanent committee of five on Standard Forms of Accounting was appointed October 2. Two additional members were appointed some time ago to assist the first named committee in completing their work and both of the committees have been instructed to bring in reports at this convention.

SUPPLY DEPARTMENT.

During the past year this department again demonstrated its value in carrying out the purpose for which it was organized, namely, standardizing and extending the use of the official shield. Up to date the association has furnished shield supplies to Independent companies in forty-four states. The supply department was never intended primarily as a money maker and has not been operated as such. Its supplies have been furnished at prices considerably lower than could be obtained by the individual companies, and yet it shows a profit during the past year of $598.03.

Judging the supply department by its work since the time it was organized there can be no question as to its value to the Independent companies of the country as the best means that could be adopted for increasing the general use of the Shield, and there is no doubt of the determination of a large number of the Independent companies to give it their support. It is entitled to the support of all in the field, and, given this, its usefulness could be increased many fold. At no time has the supply department been given the attention it really merits, but past experience indicates that any expenditures necessary to enlarge and extend it would be amply repaid through the increased business, and the greater use of the Shield secured in this manner would redound to the benefit, in general advertising, of the entire movement.

As a matter of general information I am instructed to announce that it has never been the intention of the association in establishing the supply department to make it a general purchasing agency for the Independent interests. Shield supplies only have been handled, and on a number of occasions, both before and since the last convention, we have refused the agency of various accessories which were offered us. The mission of the supply department is to extend and increase the use of the Shield, an object entitling it to the hearty co-operation of every one in the field.

MAP DEPARTMENT.

Great progress has been made in compiling maps during the past year. At present the association has on hand government post route map, with tracing of same ready for making blue prints of every state and territory in the union. Information has been received from, and spotted on tracings for, forty-two states and we can furnish printed maps or blue prints showing from forty to ninety per cent. of the existing Independent toll line development for fifteen

states and a special blue print showing important long distance connections in the territory from central Nebraska to the Atlantic seaboard and south to and including a part of Alabama.

The data on file includes maps furnished by 1,252 individual companies and twenty-eight maps covering a state or group of counties received from state or traffic associations, the whole embracing lines of about 1,350 toll line companies.

While the progress of the map department is encouraging, it is far from satisfactory and much more could have been accomplished if greater interest in this matter had been taken by all of the individual companies who were requested to furnish information. As an example of the indifference with which we have had to contend in securing the necessary data, there are letters sent by us to 903 companies remaining unanswered. Of these companies those located in Illinois have each received an average of fourteen letters, those in Indiana twelve, in Kentucky and Nebraska ten, ranging down for other states on which we have been actively working to two and three letters. All told 4,651 letters have been sent to these 903 companies. On the other hand, many of the companies have been very prompt in responding to requests for map data and are entitled to our thanks. If all of the Independent people who are requested for information could but realize the value of our maps not only to the movement as a whole but to their own companies in showing that they are a part of this great movement this unnecessary expenditure of money and effort would be obviated.

That the maps have a distinct commercial value to the Independent interests is evinced by the fact that since the establishment of the map department 160 blue prints have been sold, exclusive of 597 Ohio maps, which were printed for distribution at a purely nominal price. In addition to this we have had a large number of inquiries for maps of the various states in a cheaper form than we have yet been able to furnish them and for information regarding connections, etc., which could only be shown by a map. We are assured by persons to whom our maps have been furnished that an authentic record of this kind is one of the best means that can be used in interesting financiers and investors in the Independent movement, as it shows at a glance what the Independents have done and the revenue possibilities of their properties. The value of the map department as part of the association work is unquestioned, and with the proper co-operation of all of the Independent interests the expense of maintaining it would be greatly lessened.

GENERAL STATISTICS.

Besides working on our maps we have been constantly adding to our other data and now have a comprehensive list of rate sheets showing the situation before and after the introduction of competition in representative towns, including all of the larger places, also letters from city and state officials, business firms and representative men at various places, indorsing competition and a great deal of other information of a statistical nature for various states and the country as a whole.

This information, particularly the rate sheets and letters, has been in great demand by the Independent interests who were seeking new franchises in various parts of the country, including such important places as Providence, Boston, Milwaukee, Hartford, Omaha, Denver, Nashville and other Southern cities, and we have been informed by many receiving this information that it has been of invaluable assistance to them in preparing booklets, newspaper advertisements, briefs, etc., in order to properly present their case. It is remarkable how little is really known regarding the Independent movement by otherwise well informed people.

At Hartford, Connecticut, the figures presented by the Independents were questioned in open court by their competitor, but the association had no difficulty in securing ample proof in the shape of affidavits, copies of old bills and vouchers, etc., substantiating the information furnished.

Among other things the association has had, during the past year, to check up briefs and other documents intended for use by the Independent people for the purpose of correcting or supplementing the figures and general information on which these diagrams were based and to check up and furnish information necessary to refute various published statements made by the Independents' competitor. We have also, upon request, secured photographs of Independent buildings, lines and equipment for Independent people in preparing exhibits to show the extent and substantial character of Independent properties for use at public hearings before committees appointed by state or civic bodies.

A nominal charge necessary to cover the cost is made for all work of this nature and for furnishing data previously referred to, and in no instance is assistance of this kind given to any but bona fide Independent people. If unknown to the association officers, those seeking such help must first present satisfactory evidence that they are entitled to the assistance requested.

In securing the information of various classes as above outlined, it has been necessary, of course, to call upon Independent companies in various parts of the country, and with scarcely an exception this information has been furnished with commendable promptness. The association thanks all who have rendered assistance in this matter.

During the past year the monthly bulletins inaugurated after the 1905 convention were continued, copies of same being furnished to all of the Independent telephone journals in the field, and special bulletins covering the situation in New York state, which threatened to affect practically the whole country, were mailed to all of the Independent telephone companies in the United States and Canada, as well as to the executive officers of the various associations and to the press and journals. Special bulletins were also sent out recently on the situation in Indiana and Ohio. In addition to the foregoing, notices covering important subjects have been sent out whenever necessary to the executive officers of the state associations and leaders in various parts of the country, and on a number of occasions special articles presenting the Independent situation have been published in papers outside of the technical press, either as a matter of general information or in answer to misleading articles published by our competitor.

GENERAL.

At present there are Independent telephone associations in twenty states and Canada, and a number of new organizations pending; seventeen of the existing organizations; including Canada, have applied for membership in the International association. A number of others are considering the matter and may present their applications at this convention. The International association keeps in close touch with all of these organizations, whether members or not, and on matters of general interest all of them may be considered as affiliated with the International.

The steadily increasing attendance at conventions may be considered as an evidence of the progress of the Independent movement and of the greater interest that is being taken in organization. The attendance at the 1905 convention of the National-Interstate Telephone Association was approximately 250. This record has been broken at a number of state conventions during the past year, notably those of Illinois, Indiana, Iowa and Ohio, and the attendance at the 1906 International convention, according to the registration record, was 750. The attendance this year promises to exceed that of last, and the exhibits this year will fill over fifty rooms and the writing room, which breaks all previous records.

According to the information received by your association from all parts of the field, the past year, considered from every point of view, has been the most successful in the history of the Independent movement, and the coming year will be productive of still greater progress.

It has been discovered that the cause of serious interruption of telephone communication in southern California was a network of spider webs on the wires. To remove the gossamer-like obstruction "spider rakes" are used. They consist of 2 by 4 timbers five feet long, equipped with tenpenny nails for teeth. When laid upon the wires they serve to clear off the webs which in foggy weather make serious obstruction in the transmission of messages. The spiders, like small weavers, continue very busy, and with the aid of sea breezes, daily deposit their web-coating on the wires. The rake men are compelled to be quite diligent in order to keep connections clear.

METHODS OF CREOSOTE ANALYSIS.

The growing scarcity of lumber, with the consequent high prices, is making it imperative that more attention be paid to preservative processes whereby the time of service of timber may be lengthened. Coal-tar creosote is generally regarded as the most efficient of the wood preservatives. This product is very variable in composition, owing to differences in the coals used and in the methods employed in their distillation. Creosotes of different compositions are believed to have different values as wood preservatives, and an analysis of the oil used is, therefore, important.

No very large amount of study has been directed to perfecting the methods of creosote analysis, and the Forest Service, believing the matter vitally important to the progress of wood preservation, is now carrying on an investigation of these methods.

The most important part of a creosote analysis is the fractional distillation, since by this operation an approximate determination is made of the relative proportions of the most important substances in tar oil. There has been considerable divergence of opinion as to the best way of carrying out the fractionation of tar oils, some recommending a retort as a distilling vessel and certain temperatures for taking fractions, others recommending a distilling flask and a different set of temperatures.

Laboratory experiments carried on by the service have

shown that the difference in the weights of the fractions obtained when using different sorts of distilling vessels is not large, but that the composition of the fractions indicates a little better separation by the flask than by the retort. As regards the influence of the rate of distillation, variations of from one to three drops per second have but slight influence on the weights of the fractions, though the slower rate is more satisfactory.

It is commonly believed that the relative amounts of light oil, naphthalene, and anthracene oil are the most important factors determining the value of a creosote for wood preservation. A number of creosotes were very carefully fractioned and determinations made of the amounts of naphthalene and solid anthracene oil distilling between various temperatures. The average of the results shows that at least twenty-five per cent of naphthalene was present in the distillate between 205 and 250 degrees Centigrade, and that over twenty-five per cent of anthracene oil solids is present in the distillate above 300 degrees Centigrade. Work on the specific gravity and the index of refraction of the distillates between different temperatures is now being carried on.

The desirability of getting the criticisms and suggestions of users of creosote has led to the publication of a detailed account of the methods employed in the experiments and the results which have been obtained. Those who desire the publication should ask for Circular 80, Fractional Distillation of Coal Tar Creosote. Request should be made to the Forester, Forest Service, Washington, D. C.

THE UBIQUITOUS TELEPHONE.

The telephone is now in service in the most remote portions of the globe, among civilized and uncivilized peoples.

It is wonderful, when one comes to consider its comparatively brief life, how thoroughly the telephone has permeated regions and districts hitherto untouched by any such up-to-date example of applied science. The recent announcement of the installation of a telephone between the Shah's palace and a public square, in order that his subjects with grievances may ring him up, has prompted a lay contemporary, The Observer, to inquire further into the introduction of telephony in the far east. It was only recently that the Ameer of Afghanistan caused a telephone to be installed at his palace at Kabul, whilst the tinkle of the telephone bell is even heard in the corridors of the Ameer's harem, and both premises are brilliantly lighted by electricity. The Khedive of Egypt has been a warm supporter of the telephone, which connects his palaces at Alexandria and Cairo, 120 miles apart. The adoption of the instrument in that country has been very rapid, and at the close of 1905 the telephone company of Egypt had no fewer than 1,400 lines in working order, while 850 new lines were projected. The outlying villages are by this means kept in close touch with the central town of the province, so that all information as to the markets is readily available, and the instrument is also used largely for police purposes. Some of these lines cover distances of between two and three hundred miles.

TELEPHONE TROUBLES IN THE WEST

The Difficulties of Building a Government Line with Indians as Linemen.

By L. F. Wilson

WHILE in the government Indian service as an engineer, in the west, it became my duty to look after a telephone line which connected the office of the superintendent on the reservation with the nearest town, which was the shipping point and general supply place for the reservation and Indian school.

This telephone line would have been about fifty miles long had it been constructed along a surveyed line, turning aside only for insurmountable barriers, but it was constructed under the supervision of the principal of the office of Indian affairs, whose policy was to always use Indian labor, when not absolutely impossible. On account of the inability of the Indians to grasp ideas as readily as white laborers, this method nearly always costs the government more than if the work were done by contract.

In this case the locations of the pole holes were marked by stakes driven by an employe of the reservation and his helpers. Then the gang of Indians commenced on the holes. They got along nicely until they struck rocky ground, where they would occasionally strike stones a few inches below the surface. Then instead of moving the holes in line with the stakes, they would move it to the side, or anywhere that the ground looked good to them.

At one place the entire gang thought they were lost, and instead of continuing the line, they turned at ninety degrees in the direction they knew the road to be, and continued setting poles until the road was reached; they then made another sharp turn and followed the road until the line was reached again. The poles were spaced fairly evenly but for crookedness this line is unique.

When the wires were strung another mistake was made, in that the top wire was strung first, and the bottom one last, so that after the upper wire was stretched and the strain of the lower was added to the slender poles, there was a tendency for the latter to spring into line, and thus the top wire gradually sagged down and became twisted with the lower, precluding all possibility of using a metallic circuit, and in operation a ground was used. Since this was the case, of course the more twisting the better, as in case of one of the frequent breaks, the current would transpose itself to the other wire through a twist; although both wires might be broken many times, yet if they were not broken at the same spot the service was not interrupted.

After a hard storm and a slight earthquake shock, I started over the line with a helper, to restore our connection, which had been broken. We found twenty-four grounds, eight breaks of both wires at once, and six poles down. At places up in the mountains we found that the wires had hung so low that, at one point, an Indian herder had placed a stick between the wires, twisted them together and weighted them down, so that his sheep could walk over them.

In the whole line, crooked as it was, not one anchor guy, "dead man," or pole brace was used. After a few attempts to use climbing irons, I either stayed on the ground, or used a ladder, for I discovered that it was not possible to say before climbing it whether a pole was in the ground six inches or six feet. As the line led one through the roughest, most rocky country I have ever seen, getting a ladder up to the pole was almost always a tough job, and was often impossible. In such cases we took the pole down while the work was done and then reset it, with its two wires fast to its insulators. Of course the poles were small, light pine, or this would not have been possible.

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EDITORIAL DEPARTMENT

A BUSINESS ADMINISTRATION.

THEODORE GARY, of Macon, Missouri, the newly elected president of the International Independent Telephone Association, promises telephone men a business administration of the affairs of the association. Mr. Gary's record as a business man and as a leader in the telephone movement is guaranty that his pledges will be fulfilled. Coming to the executive leadership of the organization as he does, with the solid backing of the members from every section, Mr. Gary has an excellent opportunity to furnish a strong, progressive administration. That he will do so is the confident expectation of every friend of the movement.

As an earnest of his intentions, Mr. Gary said in his speech of acceptance:

"I esteem the honor very much—more, I believe, than to be elected to the governorship of any state in the union. In assuming these duties, if you will pardon me, I will state that I expect to carry out, as far as possible, the motto that I use in my own business, that is, 'Render Good Service,' and while I am doing that I always keep in mind that one party to the contract is the public. I shall consider the members of this association as the public in this case. It shall be my endeavor to stand for a square deal, and if it ever occurs that any of the membership of this association fails to get such a deal I shall be glad to have them call my attention to it, because if they do not receive such treatment and such a policy is not carried out, it shall be a mistake of the head and not of the heart.

"It shall be my endeavor to serve the entire interests of the association—no particular section, no particular interest, but all. The motto on the back of our program here, 'Each for all and all for each,' shall be carried out to the best of my ability. My motto along these lines, with those whom I am associated with, has always been to be frank, and I ask the members of this association to be frank with me. If there are any suggestions that occur to you I would be glad to hear of them. If there is any way occurs to you that the association could do more effective work, I would be glad to have that suggestion."

The new president of the International embarked in the telephone business ten years ago at Macon, after having spent twenty years in the real estate, insurance, banking and other schools of hard knocks in the business world.

It was only a short time after Mr. Gary became interested in the telephone business until he added a second exchange to his holdings, this at Nevada, Mo. Within six months he had exchanges in Joplin, Carthage, Webb City and Carterville, Mo. A year later an exchange was acquired at Atchison, Kan. All of these plants had to be rebuilt and new capital, in vast sums, interested, but this was quickly accomplished. Soon the exchange at Independence, Mo., was purchased and added to the list of Gary interests. Last March Mr. Gary became interested with B. F. Pankey in the purchase of the Independent Telephone Company, at Topeka, which was at once reorganized and financed, a complete underground system laid out, a fireproof building erected and new switchboards installed. Last November he went to St. Joseph, Mo., and organized a company, which became the owner of the Citizens' Telephone Company of that city.

Mr. Gary began in a small way and has grown with the business, thoroughly enjoys the work, has hundreds of stockholders and business associates, and is an enthusiastic Independent telephone man. He believes in the soundness of the business and asserts that it is the best business in the world. He was president of the Interstate Independent Telephone Association in 1903, which in 1904 was consolidated with the National Independent Telephone Association under the name of the National Interstate Independent Telephone Association, which has since developed into the International.

The removal of the International headquarters to Chicago, the logical center of the Independent field, is sure to prove a great advantage to the association and those actively identified with its work. The selection of Charles West, of Pennsylvania, as secretary, also will prove a wise move, as he has demonstrated his loyalty to the cause, and his ability to further its interests.

The association is now in excellent financial condition. Both President Gary and James B. Hoge, his predecessor,

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attributes this fact to the efficient work of the finance committee, consisting of E. L. Barber, Walter Doolittle, H. B. McMeal, W. H. McDonough, C. Y. McVey, W. B. Woodbury and J. G. Ihmsen. The committee was given a vote of thanks by the convention and will be continued during the coming year. All in all, the association enters the new year with better prospects of success and development than ever before known, and to fulfil these anticipations every member should do his part loyally.

FREE BUSINESS TELEPHONES.

AN enterprising grocery and market company in a Connecticut city has decided to try the plan of installing free telephones in the houses of its customers. As a starter the concern has ordered the company to install instruments in fifty homes, all of the expense to be met by the firm, who hopes thereby to acquire and hold the patronage of the people so favored. It is a novel experiment in the pursuit of business, and one that is likely to be most successful. Needless to say, if the plan works well it will come into general use. It is likely to lead to a revolution in business methods governing that particular line of trade.

The head of this grocery and market conceived the idea that the telephone would not only prove a great convenience to his customers, but would obviate the necessity of his firm employing men to solicit orders. The saving in time, of course, is another advantage, and the improved service doubtless will also tend to make the innovation both popular and practical. The universal use of the telephone has made the merchant turn to such a plan as a good means to extend his business. That he is likely to find it a trade-producer is considered probable. Connecticut is the state which gained fame by producing the wooden nutmeg, and it is apparently as enterprising as ever.

INDEPENDENTS ENTER NEW YORK.

AFTER many years of monopoly in New York City the Bell telephone trust is obliged to yield to Independent competition. On the 15th of June the city board of estimates and apportionment voted to grant a franchise to the Atlantic Telephone Company, which for eight years has been struggling to gain a foothold in the metropolis. The exact terms of the franchise will be decided later, but a general outline shows that they will be much more favorable to the public than have been the conditions under the monopoly of the Bell. This victory was not gained without a great struggle. The representatives of the Bell combine fought any favorable action by the board until the final vote was taken which showed that the officials of the city were converted to the people's side. With its customary viciousness the Bell, through its agents, accused the Independents of being engaged in a stock-jobbing scheme and that they were not ready to fulfill their contract. An able defense was made by the representatives of the competing company, and the board upset the trust's plans and voted in favor of the franchise.

The victory won in New York leaves but two large cities in the United States that are now wholly in the grasp of the Bell monopoly—New Orleans and Cincinnati. The Atlantic company first made application for a franchise in 1899, but at that time the city administration was so thoroughly subservient to the Bell trust that no favorable action could be obtained. For the succeeding four years the board of aldermen blocked any progress, and it was not until the law was changed, placing the granting of public franchises in the hands of the board of estimates and apportionment, that the Independents could make any headway. Public sentiment, however, was against monopoly, and was at last recognized.

It is understood that the Independent franchise will provide for the payment of compensation to the city of New York of approximately $3,000,000. These payments are based on 2, 4, 5 and 7 per cent of the estimated gross receipts of the company each year, covering a period of twenty-five years. The franchise will also give to the city departments free telephones and provide for a five-cent call rate for the city at large. The rate for business telephones, it is said, will be $106, with unlimited calls, and for residence telephones from $60 to $80, with unlimited calls. A few details are yet to be determined, among which is the guarantee fund to be deposited by the company, the city holding that said fund should be $200,000, and the company wishing to put up only $100,000. Prominent business men of New York are backing the new company, which is starting out with brilliant prospects of great success.

The wretched service the Bell has given New York subscribers has had much to do with the approval given the Independents' application for a franchise. Secure in its sense of absolute ownership of telephone privileges, the Bell corporation has proceeded on "the public be d——d" policy, and given as little as possible in the way of service for the money charged subscribers. Wide-spread dissatisfaction has resulted, and the complaints of Father Knickerbocker have been loud, deep and numerous. When the Independents are established, the Bell will probably make some concessions, give better service, and, in short, manifest a disposition to admit that the public is entitled at least to decent treatment. That is the inevitable consequence of competition. In fact, already the Bell company in New York is offering to improve conditions. If the city officials are wise, however, they will invite competition, and make doubly sure that they are to realize emancipation from the bondage of telephone monopoly.

EXPENSE OF TELEPHONE REMOVALS.

ONE of the questions which often cause friction between telephone companies and their subscribers is: "Who should pay the expense of moving a telephone from one location to another—the company or the patron?" The telephone has become such a necessity that a person grows so accustomed to its convenience that he is loath to do without it, and when he moves from one house to another he is as anxious to take his telephone along as his easy chair. Only he would like to have the telephone company bear the expense of the removal.

Especially at the season of the year when removals are the order of the day, the furniture van is abroad in the streets and the luckless flat-dweller in the city flits from place to place, the question is an important one.

F. J. H., of Sharon, Pa., writes: "Will you kindly advise me through the columns of your valuable magazine of a few good reasons why a subscriber to an Independent telephone company requesting a removal of his telephone from one location to another should not bear the actual expense incurred?"

There is no reason why the telephone company should pay the cost of moving a telephone for a subscriber any more than it should pay for the transfer of his cook-stove or his chairs or his bedroom furniture. The point is usually raised by the subscriber that the instrument belongs to the telephone company and that the latter should pay for carting its own property around. A little thought, however, shows the fallacy of such reasoning. Supposing a man rents a piano—as he practically rents a telephone—and during the life of that lease desires to change his home. Doesn't he, as a matter of course, pay for the dravage on that piano from one place to another the same as he pays for the removal of his own chattels? It never occurs to him to ask the music house which rented him the piano to pay for the removal. No more should he expect the telephone company to bear the expense of removing the telephone and installing it in his new home.

The same rule, of course, applies to either Independent or Bell companies. It requires skilled workmen to move

the telephone, but the subscriber should foot the bill. Usually, the companies charge only enough to cover the actual expense, which is but fair and just. There is, however, no doubt that equity demands that the subscriber stand the cost of the removal.

AN ANARCHISTIC UTTERANCE.

FROM time to time prominent men in the camp of the Bell telephone monopoly criticize the Independents for attacking the monopoly and its agents, and calling hard names. With some justification, the Bell spokesmen declare that it is shortsighted policy for one class of telephone men to carry on a crusade against another, and that the advancement of the entire telephone industry instead should be the aim of all concerned. "What hurts us is likely to hurt you in some way some time," is the substance of what the Bell often tells the Independents, in trying to secure immunity from attack as a monopoly.

To a certain extent this is true, for in the injuring of telephone securities, generally speaking, the stocks and bonds of Independent companies are often as likely to be affected as are those of the Bell—always making allowance, however, for the ever present and potent fact that the ownership of Independent securities by local capital gives the Independent companies an immense advantage over the unwieldly and unpopular Bell combination. It is granted, then, that it is unwise to make a general onslaught on the telephone industry for the purpose of hitting the Bell a blow:

But what of this?

"We hope and believe that all of the Independent telephone companies will follow this one into bankruptcy. Their organization and operation amounts to practical blackmail."

These are the words of Judge D. Cady Herrick, of New York, one of the legal counsel of the Bell monopoly, who was referring to the financial difficulties of the United States Independent Company. A fine statement truly to come from a man who represents interests that have been lecturing the Independents for intemperate language! And yet, as one newspaper has pointed out, this is "the business courtesy that large trusts offer competitors for business." There is no doubt that an X-ray capable of discovering the workings of men's minds would show that the Bell magnates secretly wish the utter collapse of the Independent movement. At the same time few would be so recklessly vicious toward a competitor as to publicly pray for his financial ruin. This spasm of rage from D. Cady Herrick indicates that the people of New York made no mistake when they rejected him as a candidate for governor—for D. Cady, it will be remembered, once tried hard to acquire that exalted office. The man capable of uttering such a contemptible sentiment as quoted above would have been sure to disgrace the governorship before his term of office expired.

Heads of trusts and officers of corporations are fond of branding as "anarchists" those who dare to suggest that corporate wealth and power should be regulated and controlled. Government officers who would venture to protect the public from monopoly and its greed are pictured as enemies of commercial progress—fit associates for bomb-throwers and incendiaries. They are, in short, "anarchists," as viewed by trusts which think they should rule by divine right. Unwittingly, of course, D. Cady Herrick has qualified for membership in this class, for if ever anarchy breathed in words it permeates the wicked wish, as expressed by that person, that all Independent companies fall into bankruptcy. This is a kind and prudent sentiment, indeed, when one considers the millions invested by the people of the United States in local telephone enterprises!

But, it well illustrates the feeling of the Bell combine toward Independent competitors and for that reason should convince the Independent operators of the folly of dealing with the trust. D. Cady Herrick isn't a brilliant harbinger of peace.

A HOT WEATHER HINT.

WITH the arrival of hot weather the "trouble sheets" of the telephone exchange are likely to show more entries than are wont to be recorded there. The records of most exchanges show more complaints in torrid weather than when cool breezes blow, and the telephone experts have come to attribute this to the fact that people are more inclined to be irritable and impatient when the sun is hottest. The subscriber is likely to be short of temper, and more ready to register a kick because of delay. Notice is given that "there is something wrong with my line," and often the "trouble man" makes an investigation only to find that the subscriber was a little hasty and out of sorts—all due to the hot weather. To tell the truth, it is not the pleasantest thing in the world to be telephoning while the mercury stands at 100 in the shade, but even at that it is much better to telephone, even in hot weather, than to walk or ride several miles to perform an errand that might be attended to over the wire.

In the big cities the telephone companies have to increase their forces in the maintenance departments in hot weather to care for the complaints that are more numerous at such seasons. At such times both the subscribers and the telephone force should be as patient and forebearing as possible. Co-operation in this particular will facilitate telephone service and help everybody—besides cultivating a spirit of charity and helpfulness that will prove beneficial all the year around.

So, no matter how hot the weather gets, see that your temper keeps cool.

NORTHERN PACIFIC ADOPTS INDEPENDENT EQUIPMENT.

THE Northern Pacific Railway Company will install an Independent private exchange in its general station in Spokane, Washington. The change will be made to concentrate the company's business and take it away from the Pacific States (Bell) Telephone Company, thus assuring quicker service. The lines will connect the superintendent's office, the general agent's office, the yard offices, the local freight office, the depot ticket office and the apartments of the trainmaster, roadmaster and claim agents, the telegraph room and the round house. Fourteen lines will be utilized, and the board for their accommodation has been ordered and will be put in place as soon as possible. The dispatcher's office at Pasco, Washington, and Trout Creek, Montana, will be connected. This will facilitate the work of dispatching trains at these points, where divisions have a terminus. The board will be in charge of three shifts of girls, each working eight hours. Where the quickest and most reliable service is desired Independent equipment is invariably installed.

REFUSED A TELEPHONE PASS!

THE practice of public service corporations which expect legislative favors giving passes and franks to the members of the law-making bodies whence those favors proceed, received a severe jolt in Michigan recently. It seems that several bills were pending in the legislature in which the Michigan State (Bell) Telephone Company was vitally interested, and that corporation sent a coupon book of telephone franks, entitling the holder to free service, to every member of that body.

Representative Stacy Thompson of Manistee, astounded everybody by sending the book back in a letter refusing to accept gratuities, discounts or favors of any kind from a corporation interested in a bill on which he would have to

pass in an official capacity. In the letter Representative Thompson called attention to the fact that during his business career of thirty years the Bell company had never sought to give him anything for nothing, that he had always paid for his telephone service, and that, in short, the coupon book, valued at $12.50, was not acceptable to him under the circumstances.

The inference was that the Michigan Bell had not given the 132 members of the state legislature a telephone pass without expecting a favor in return, which is a reasonable presumption in view of what the telephone monopoly has done in various states to influence legislation in its behalf. It is to be hoped that Representative Thompson's example will have the effect of discouraging the distribution of telephone franks among legislators and other public officials.

WHEN MIGHT IS RIGHT.

HAVING a practical monopoly in telephone service in Louisiana, the Cumberland Telephone & Telegraph (Bell) Company has submitted a request to the state railroad commission for permission to abolish the night rates on long-distance messages and substitute therefor the regular tolls charged during the day. With Independent companies furnishing competition the Bell combine would not dare to attempt to raise rates in such a manner. As the night rate is lower in all states where there is competition, the lesson is self-evident.

TWO GOOD RESOLUTIONS.

AT THE convention of the International Independent Telephone Association two resolutions were adopted which every Independent should keep in letter and spirit. The whole fabric of Independent telephony is built on independence and freedom from monopoly. The first resolution takes up the question of Bell connections, and follows:

"Whereas, The Bell Telephone Company is insiduously proposing long-distance connection to local Independent telephone companies in various parts of the United States and offering in consideration of entering into such connection to abandon the local field; and,

"Whereas, It is the sense of this convention that any such connection is bound to injure the Independent telephone cause as a whole; therefore be it

"Resolved, That this association frowns upon and denounces any affiliation or connection of Independent companies with the Bell company anywhere on the American continent as being injurious to the people as a whole."

This resolution, which was carried unanimously, shows the spirit of the Independents. There must be no compromise with the Bell company, no entangling alliances. Each Independent company must be independent.

The second resolution points the necessity for keeping one of the unwritten laws of the anti-monopoly crusaders, which we are glad to say has seldom been broken. The resolution reads:

"Whereas, There are difficulties and dissensions arising from an infringement by an Independent company on the territory already occupied and served by another Independent company; and,

"Whereas, Such an infringement is injurious to the cause of Independent telephony; therefore, be it

"Resolved, as the sense of this convention, That the company on the ground and satisfactorily serving the public shall be entitled to recognition by this association and any company or individual infringing on the rights of such Independent company shall be repudiated and shall not be admitted to membership in this association."

It is needless to remind good Independents of these two points. Simply that there may be no misunderstandings the resolutions should be given wide publicity.

INFORMATION WANTED.

THE Home Telephone and Telegraph Company of Fort Wayne, Indiana, sends TELEPHONY the following letter:

The city of Fort Wayne is about to install a municipal street lighting system and contemplate using the series alternating arc machine and use what is known as the loop system for its lamp circuits. The city claims to have certain franchise rights on our poles and will use every effort possible to compel our company to allow it to use the poles.

We have had of late quite a great deal of experience with alternating currents, some of which resulted in the expenditure of large sums of money to overcome induction difficulties. Our company is opposed to the city using our poles for the series alternating arc current and we wish to obtain all possible information as to the objectionable features to a telephone system by the use of this current. We are very anxious to get reliable reports of places where the series alternating system is in use and how and by what means the telephone companies overcome the induction? Whether it would be considered safe to allow the high voltage current on telephone poles, and whether it is possible to install the series alternating arc loop system in a manner to overcome the induction. We also want names of places where the alternating current for street lighting has been abandoned and the direct current substituted.

Bids for the construction and equipment of this system will be let within a short time and we are very anxious to get all the information we can by return mail.

TELEPHONY requests its readers to send the Home company information on this subject. Address letters to W. L. Moellering, Secretary, Fort Wayne, Indiana.

"'TIS BUT A TENT."

The telephone has reached Persia. According to foreign advices a public telephone connected with the Shah's palace has been installed in the market place at Teheran, the Persian capital, so that subjects of the monarch may lay their grievances before him without delay. An English versifier takes this for a text and thus invokes the muse of Omar Khayyam:

I passed at Morn across the Market Square
And lo! a strange Kiosk was standing there,
  Whence to the Palace of the King of Kings
A burnished Wire stretched gleaming in the Air.
I spake with one about to enter in:
"Brother, pray tell me what thou would'st begin?"
  Quoth he: "I venture on the Telephone
(A work of Sheitan or some potent Djinn).
They say that in a kind of Harem sit
Before a Loom (designed by Frankish wit
  And called by them a Switch Board), Odalisques
Who answer, when the Faithful call for It.
And they who penetrate that silent Door,
And with Insistence in the Mouthpiece roar
  Through It perchance may gain the royal Ear
And win the Justice they were hoping for."
"Cut off," one cries, emerging from the Hut.
"We have the Scimitar and the Bowstring, but
  The Franks conspire to arm the hands of Fate!"
And goes his way with many a murmured "Tut."
Another in the Slot his Coin throws,
And bellows multitudinous "Hallos";
  But, having failed to press the Lever down,
Cannot be heard and forth in Dudgeon goes.
"Perchance she knits, or plays some girlish game,"
Quoth he; which plainly does the truth proclaim;
  Follow the Sun his fiery course around,
In every Land subscribers are the same.
However, those who seed of Progress sow,
And labor with their Hands to make it grow,
  Deserve the Harvest they at length shall reap
When over all the Land their Lines shall go.
A book of Numbers underneath the Bough,
A Telephone connected up somehow
  Beside me ringing in the Wilderness,
The Wilderness where civilized enow!

A German recently applying for a position as line man, was asked among other questions if he could "guy a pole?" He replied that he was familiar with guying his own countrymen, and he guessed he could "guy a Pole" as well as any other nationality.

CABLE TESTING IN MULTIPLE TAP WORK

By P. Kerr Higgins

MUCH has recently been written in the telephone journals covering the regular testing of cables and the location of trouble in them, but most of these articles have covered a straight cable pair—that is, one with no multiple or bridged taps—and several wire chiefs and others with whom I have conversed recently did not seem to understand that special testing was necessary in

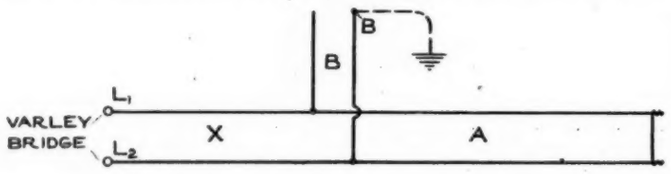


Figure 1.

multiple cable work. In explaining these special features it will only be necessary for me to give a standard example in each test, as the same special features brought out in this paper would apply in a similar manner to any other test which might be applied.

Conductivity Test.—This test is made with a view to ascertaining the conductor resistance, and in a cable free from multiple taps would be made in the regular manner by means of the Wheatstone bridge, connected in one of two ways. If a grounded line, one wire from cable wire to bridge, other side of bridge grounded and the end of the cable wire grounded. The above test is frequently unreliable and all tests should be made metallic when possible to do so. In the metallic test the ground is dispensed with and both cable lines, or wires, connected to bridge and the outer, or distant, ends connected together forming a complete metal circuit. If, however, multiple or bridged taps are connected, then separate tests must be made with the loop connected at the distant end of each tap, all other taps being open. In order to get the actual resistance of the

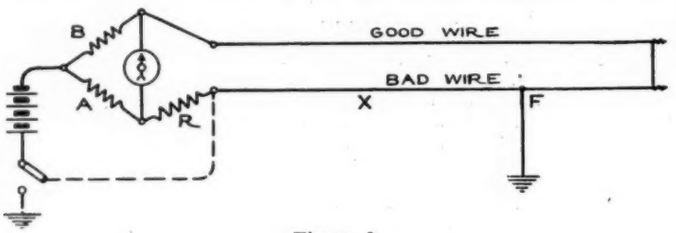


Figure 2.

multiple taps separately it will be necessary to use the Varley or Murray test. This may be done by grounding one of the conductors at *B*, Figure 1, and obtaining the resistance from office. Now make a comparative test between loops *A* and *B*. The resistance of one wire to bridging point is now known and the resistance of the loops from the office to that point can be found by multiplying this result by two. Now make a conductivity test of both loops and if loop $X + A = 100$ and loop $X + B = 110$ and the known resistance common to both to the bridging point is 50, as shown by Varley test, then the resistance of loop *A* will be 50 and that of *B* 60 ohms. This test is frequently necessary in trouble location.

Insulation Test.—In testing for insulation in straightaway work, we have only to consider the distance between the office and the distant end of the cable, but in multiple tap work the total distance of all the multiple taps must be taken into consideration, and makes a difference in the resulting capacity per mile and in the location of trouble for open wires by the capacity method, Figure 4, makes such a test much more difficult and complex, which will be considered later under fault location. In making the insulation test, see that the ends of all multiple taps are open and free from ground or leakage of any kind.

Varley Test.—This test is too well known to require any lengthy description, and it will suffice if I give the simplest formula used for this test and then explain its application to multiple cable tap work. I consider the Varley loop test for general purposes the most serviceable of all, except when very low resistances are encountered where the Murray loop test is best.

Both the Varley and Murray tests involve the use of a

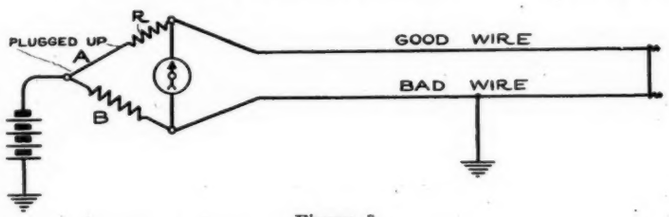


Figure 3.

loop consisting of the bad wire and joined to this at the distant end a good wire of approximately the same resistance as the bad wire, both together forming a loop from the testing point to the end of the cable under test. The circuit thus formed is shown in Figure 2, and the connections for this test are also shown.

Assume $X =$ the resistance of the bad wire to F (the fault, then the arms of the bridge A and B are arranged with equal values, say 100 ohms each. A balance is obtained by varying the resistance in the arm of the bridge R until no current is shown to be flowing through the galvanometer. Call this balance resistance L. Now ground the battery by moving the switch as shown in dotted lines. This reading, or balance, we call R; then, without going very deeply into mathematics, the formula is reduced to its simplest form, namely $X = \frac{L - R}{2}$. You will note that $L =$ resistance of the loop consisting of the bad and good wire and R was the Varley test, and X will give the resistance from the testing point to the trouble, *provided* that there have been no multiple taps. If, however, there are multiple taps and the trouble should not be on the branch or main cable you are testing, then the trouble indicated by X would simply indicate the branch on which the trouble

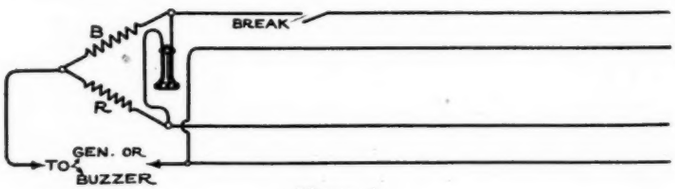


Figure 4.

is located and another test, similar to that already made, will have to be repeated in the branch in which the trouble is shown to be, and the result X will then indicate the location of the trouble in ohms. The distance in feet is found

by reference to a table of resistances of different gauges of wire.

Dividing R by L, and multiplying the length by the quotient obtained, will give the distance from the end of the cable to the trouble. If the length of the cable is not known, but the gauge of the wire is, then multiply R by the number of the feet per ohm of the wire from the end of the cable to the fault. Be careful to get the bad wire on the proper post of the bridge, which is done by creating the conditions as shown in the theoretical diagram, Figure 2.

Murray Test.—The theoretical diagram for this test is shown in Figure 3. In the B arm 1,000 ohms is unplugged and the A arm is left plugged up. The arm R is used as a rheostat as before and unplugged or varied until a balance is obtained as in the Varley test, then $B:R::AX:BX$ and $B\,(BX)=R\,(AX)$.

L=Total length of wire (twice length of wire in cable), $AX=L-BX$ and 1,000 $BX=R\,(L-BX)$.

$$BX=\frac{RL}{1000+R}$$

In other words, distance to trouble is found by multiplying resistance unplugged in arm R for balance by twice the length of the cable in feet and divide result by the sum of 1000 and R; e. g., resistance R=1000, length of cable 1,500 feet, then

$$\text{Distance to trouble}=\frac{1000\times 2\times 1{,}500 \text{ feet}}{1000+1000}$$

This is a very simple test, but both conductors in cable must be approximately the same distance. The same proviso made for the Varley test as to location in multiple tap work applies to this case.

In difficult cases it is well to make both a Varley and a Murray test, and compare results when the best result may be had as to accuracy.

Cable Troubles.—All cable troubles may be located by means of the above tests or a modification of them. In the case of crossed wires having no resistance at the trouble, the conductivity test only is necessary; where the trouble shows resistance, then one of the crossed wires should be grounded and the test proceeded with as if trying to locate a ground. In the case of open lines, make a capacity test by means of the balance method, Figure 4. In such a case the capacity of the table under test must be reasonably uniform and its capacity per mile or 1.000 feet known, or a comparison made as shown between a good and a bad pair of wires. If multiple tap work exists, tests must also be made on the branches when the location of open wires becomes more difficult. The Murray test may be also used for this purpose, as shown in Figure 3, using the secondary of an induction coil in series between the ground and the bridge junction as shown. In the primary of the coil are a buzzer and battery, and a telephone receiver is used in place of a galvanometer. The arm R is varied until the noise of the interrupter is not noticeable. A generator may be used instead of the buzzer, and a slide wire bridge may be used instead of the regular Wheatstone bridge.

HOW TO CALL NUMBER TWENTY-ONE HUNDRED.

Boskins' office boy was away on a vacation last week, and Boskins undertook to answer the telephone, says the New York Press. He is now firmly convinced that the ways of the telephone girls are past finding out. He had always been treated courteously by the sweet-voiced "hello-girls," but he has come to believe that they were only making game of him.

Boskins had to call No. 2100 several times in the daily course of business. The first day after the office boy had gone he took down the receiver with confidence.

"Give me twenty-one hundred," he said.

"What is it?" asked the girl, in a shocked voice.

"Twenty-one hundred," repeated Boskins, with precision.

"Oh, you want two-one-naught-naught," said the girl kindly, as she gave him the number.

Boskins felt rebuked, and he remembered the correction, storing it away for future reference. "Always say each figure separately," he told himself. "Don't attempt any fancy combinations."

He was in a good humor the next time he called the number.

"Give me two-one-naught-naught," he said.

"Two-one-double naught," said the girl promptly, with the accent on the "double" as though correcting him.

The next time he called the number he decided to try the new combination. "Two-one double naught," he said pleasantly.

"Twenty-one-naught-naught," said the girl, and Boskins retired still more bewildered.

That afternoon he had to call the number again.

"Twenty-one-naught-naught," he said, and held his breath.

"Twenty-one double-oh," corrected the girl, as she gave him the connection.

Boskins was so confused by that time that he could hardly talk. It worried him all the afternoon. He wished the office boy had not gone away. Then in despair, he took a pencil and figured out that the number could be given in nine different ways. They were:

Twenty-one hundred.
Twenty-one-naught-naught.
Twenty-one-double naught.
Twenty-one-oh-oh.
Twenty-one-double oh.
Two-one-naught-naught.
Two-one-double naught.
Two-one-oh-oh.
Two-one-double oh.

Boskins studied them all over and hope rose again within him. The next time he approached the telephone it was with an air of confidence.

"Twenty-one-oh-oh," he said. A smile played about his round face. He wondered how the telephone girl would receive this combination. It was the only one she had not given him. There was a moment's silence after he had spoken the number. Boskins smiled at his own craftiness. This was indeed a Machiavellian triumph.

The girl asked him to repeat the number.

"Twenty-one-oh-oh," said Boskins, like one propounding a riddle.

"Oh, you want two-ten-naught," said the girl brightly. Boskins weakly hung up the receiver. He thought about it a long time, and finally decided that it was useless to stake his poor wits against those of the telephone girls.

"They might have a hundred combinations, for all I know," he grumbled.

Boskins hired an office boy the next day.

The census bureau has just issued a bulletin giving interesting statistics relating to the manufacture of telephones and telephone supplies. The data is for the year 1905, and shows the aggregate value of telephone apparatus manufactured that year to be $15,863,698 as against $10,512,412 for the year 1900, when the last census report was made. According to the 1905 report Illinois is the center of the telephone manufacturing industry, as more than half of the total products were made in that state. The latest bulletin shows a gain of 34.9 per cent in the number of establishments, of 108.1 per cent in capital, and of 52.3 per cent in the value of products.

ALL CABLE DISTRIBUTION

Abstract of an Article, from the Cumberland Telephone Journal, Giving Deductions and Suggestions.

By E. D. Reynolds

I WISH to make clear in the beginning just what we regard as an all cable distribution. When a plant is distributed by cable from the exchange to a point very near the substation, and from the nearest terminal head, the substation loop is carried to its terminus by means of a twisted pair rubber covered wire, and only a minimum of open or iron wire is used in an entire plant. We may regard

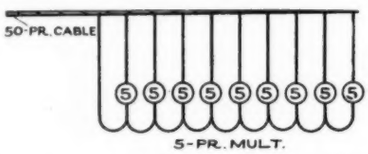


Figure 1—Fifty Pair Distribution to Five Pair Taps.

this as being an all-cable plant. This applies also to an entire underground proposition.

In dealing with the subject of cable distribution there are so many features to be considered that it would require more space than that embodied in any one article to do the subject entire justice. We have before us a very large field, and one

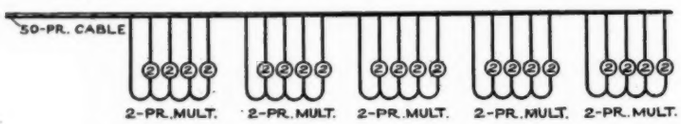


Figure 2—Fifty Pair Feeding One Straight Lead, Two Pair Taps. Two Pair Multiple Arranged in Five Sub-Divisions.

that has not been tilled as thoroughly as have some others in the realm of telephony. The development and improvement in switchboards and all apparatus pertaining thereto, instruments, transmission problems, operating, etc., have proceeded by leaps and bounds, until the earlier forms and the most up-to-date equipment scarcely recognize each other as being blood kin, but with but few exceptions we are still doing ca-

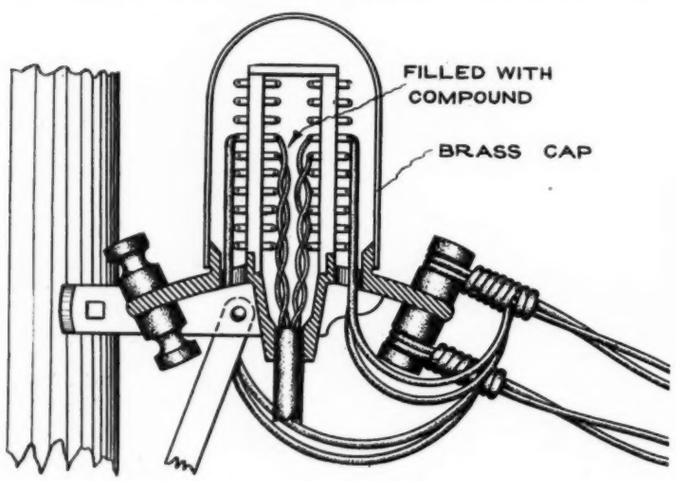


Figure 3—Terminal Head and Distributing Ring.

ble and construction work just as we did when I began packing a troubleman's tool kit as a "cub" in the business. Does this mean that cable distribution and cable methods were then perfect, and that there could be no further improvement? I think not. I believe the time is at hand when the attention of engineers will be turned to this subject, and if we do not see some radical changes in the near future I shall consider myself a false prophet. As it has been my good fortune to be assigned to this line of work to try to solve some vexatious points, I will present for consideration the

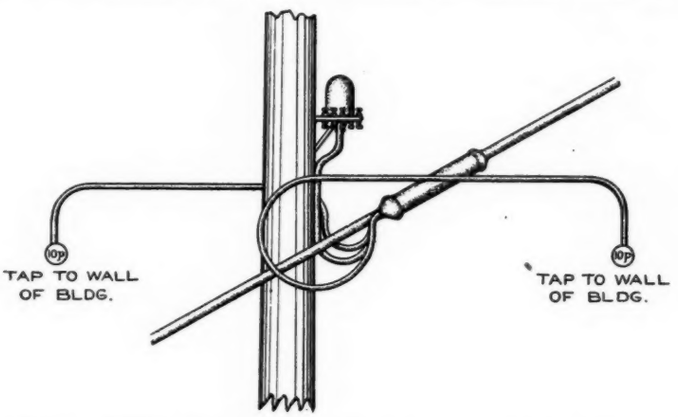


Figure 4—Method of Relieving Congestion of Distributing Wires on One Pole.

deductions I have arrived at thus far in my studies and experiments.

The rapid growth of subscribers and the attendant multiplicity of wires call for a large increase in cables. A very large increase in cables calls for a larger increase in terminal

CABLE Nº 1.															MULTIPLE										
BLOCK	SUB	TAP	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20

Figure 5—Cable Record Form.

heads. A large number of terminal heads means, except in the most congested districts, smaller units to the head. And finally the larger amount of tapping necessary demands a cheaper method of tapping. These points follow each other in logical order and cannot be avoided. We will discuss these points separately. To begin with, an all-cable distribu-

CIR.	D.	M.	ROUTE	NAME	ADDRESS

Figure 6—Cable Record Form.

tion is desirable from its many advantages over the open wire system. The maintenance charges are reduced very much and saving is made along other lines. It eliminates a large amount of heavy overhead work, permits the use of much smaller poles, cuts down the trouble force and can be made to dispense with line order crews almost altogether. It does away with sleet liability, reduces troubles and eliminates the troubles caused to subscribers by line order crews and the constant cutting and changes, and should also reduce the force in the terminal room of large exchanges. The use

of an all-cable distribution, of course, calls for increased terminal points; these should be in small units. This is conclusive, for if we use large units, we have either to waste terminal facilities or use long runs of rubber covered wire in order to reach enough subscribers to give the terminal its load, or to use open leads, with protected boxes, etc., and to assume all the burden and liability of open distribution, and that we are trying to escape. The long runs of rubber covered wire are expensive and there is certainly no

CABLE Nº

BLOCK	TAP LOCATION	SUB.	TAP LOCATION	SUB.	TAP LOCATION	SUB.	TAP LOCATION
A		a		c		e	
		b		d			
B							
C		This part of form to be used when block is subdivided					
D							

Figure 7—Cable Tap Record Form.

economy in large terminal heads, carrying a few subscribers, so the proposition indicates on its face: small terminals and plenty of them. This leads directly to the assumption that in order to have plenty of terminals both the terminal apparatus and the method of tapping should be cheapened. This feature I will take up later on in this paper. Just here it is proper to bring up the subject of multipling cable. It it my personal conviction that multiples in cable work are a necessary nuisance, and, like powerful medicines, to be taken in small and broken doses. I do not believe that cable wires multipled in large units, or extending over large areas of territory, are as desirable as close acquaintances, as some would have us believe. I believe that simplicity, as far as is consistent, will cover a multitude of sins,

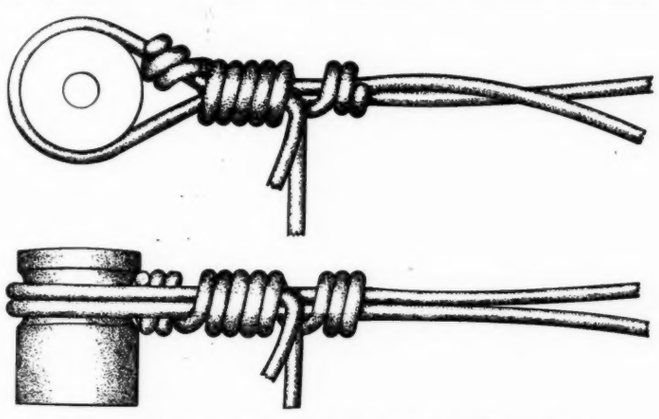
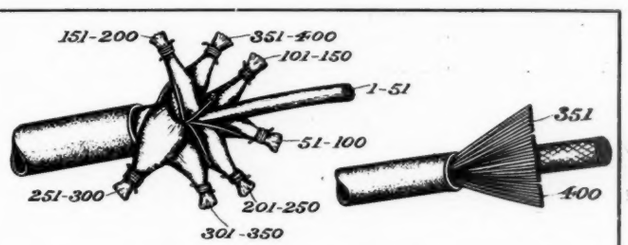


Figure 8—Method of Handling Twisted Pair House Drops.

and we will gain in simplicity and ease of handling somewhat of the advantages claimed in other and more cumbersome methods of multipling. With these points firmly fixed in my mind, I have suggested a system that is a combination of direct and multiple work, in small units, fully exploited in the accompanying specifications. Reference to these specifications will show that I have made some radical departures from the accepted methods, namely, the very small units I am advocating and the method of tapping feeder cables. Needless to say, this departure has provoked the usual amount of adverse criticism and doubt as to the feasibility of the method proposed. The scoffer and the "doubting Thomas," like the poor, are always in evidence. The question frequently is asked me: Who else has done this thing you are proposing? We also ask: Who else ever sent a message over the wire before Morse did or who else talked over a telephone before Bell did? I wish to take the position that whether anyone else has or has not done these things, I believe they can be done in a commercially practicable manner. I believe it has got to be done. I believe we will tap cables for from one to ten pairs as may be needed, and I believe that it can be done after the method set forth in these specifications. After all, when we get down to facts and stare the matter boldly in the face what do we find? A mechanical problem, nothing more,



CABLE Nº1 — BLOCK - A

SUB.	TAP*	DIRECT		MULTIPLE		REMARKS
	1	61	80	81	100	
	2	41	60	81	100	FOR 10-PAIR HEADS
	3	21	40	81	100	
	4	1	20	81	100	
	1	81	90	91	100	
	2	71	80	91	100	
	3	61	70	91	100	
	4	51	60	91	100	FOR 5-PAIR HEADS
	5	41	50	91	100	
	6	31	40	91	100	
	7	21	30	91	100	
	8	11	20	91	100	
	9	1	10	91	100	
	1	93	96	97	100	
AA	2	89	92	97	100	
	3	85	87	97	100	FOR 2-PAIR HEADS
	4	81	84	97	100	
	1	73	76	77	80	
AB	2	69	72	77	80	WITH
	3	65	68	77	80	BLOCK SUBDIVIDED IN 10-PAIR
	4	61	64	77	80	SECTIONS
	1	53	56	57	60	
AC	2	49	52	57	60	
	3	45	48	57	60	
	4	41	44	57	60	
	1	33	36	37	40	
AD	2	29	32	37	40	
	3	25	28	37	40	
	4	21	24	37	40	
	1	13	16	17	20	
AE	2	9	12	17	20	
	3	5	8	17	20	
	4	1	4	17	20	

Figure 9—Standard Arrangement of Cable Conductors for Ten, Five and Two Pair Distribution as Prepared to Lay Out on Main Frame Bar.

only a question of workmanship. From a number of experiments made in our laboratory I have proved that by making the proper slit in a cable we can reach any wire that we wish, make connections, treat fully in all the various steps of splicing, and close the cable again without the aid of the time-honored split sleeve and wiped joints; and obviously the smaller the taps the easier this is to do. I am still further prepared to venture the assertion that in a short time the telephone engineers of the country, together with the cable manufacturers, will devise a self-tapping cable, that is, a cable with accessible tapping points at specified intervals, aided by color schemes, or branched assignments in the cables. And tapping cables will be brought to the same state of simplicity that is involved in tapping water or gas pipes. This may seem visionary, but I am very firm in my belief that the ideas I have advocated above will in the very near future be fully exploited along the lines sug-

gested. We are experimenting, and I think will be prepared very shortly to offer a method of giving a cable service to country subscribers to take the place of some of the heavily loaded country routes, that are used at present. If this be true, an all-cable plant will come nearer being what the name indicates.

I am contending that the chief and about the only difficulties to be overcome are mechanical problems. We have not completed our studies on the "grafting" method of tapping and therefore are not prepared to issue detail specifications on that feature. Briefly speaking, we propose to graft the small taps into the parent cables by means of suitable openings in the sheath, the end of the tap being split, spread out and used as a shield or a separate shield inserted, to accommodate the increase in bulk of the conductors, one to the added wires and connections of the tap. The terminal head I am submitting will be found to possess some new features. It is very small and compact, and is a combination of pothead, cover and insulators assembled in one fixture. When this terminal ring is placed on the pole and the tap made, the installation is complete in itself. There are no rubber pothead wires. The paper core cable terminates on punchings or binding screws in such shape that the end of the cable can be sealed as in ordinary practice with compound. The connection from these points to the substation may then be made without any other connection in the circuit. This terminal head complete is produced at a satisfactory figure in cost. It seems to be an accepted fact that the initial cost of an all-cable system is greater than the open wire. We have just completed some figures of comparison in a certain district of our home office, this district being laid out as an open wire plant, then as an all-cable system. Our figures were considerably in favor of the all-cable plan. While personally I believe this will bear out in other plants of our system, I would not wish this comparison to be regarded as conclusive, and believe a study should be made of several lay-outs in different parts of our system for conclusive figures.

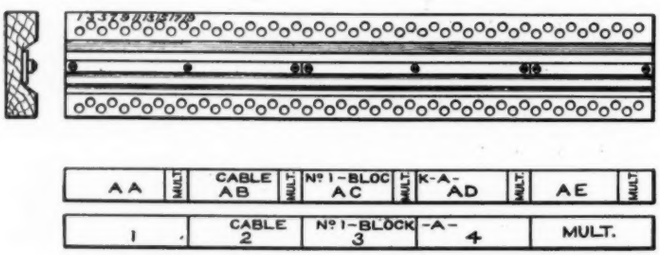


Figure 10—Method of Marking Main Frame for Fifty Pair Distribution in Two Pair Heads.

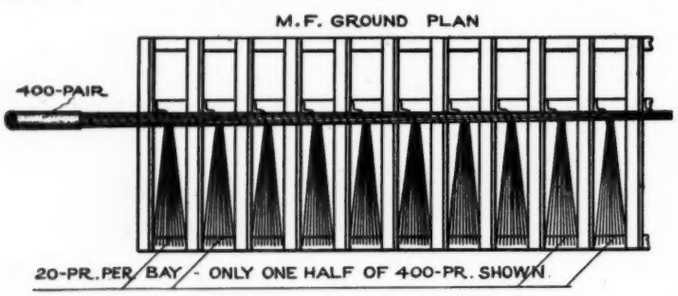


Figure 11—Method of Fanning Cable on Main Frame.

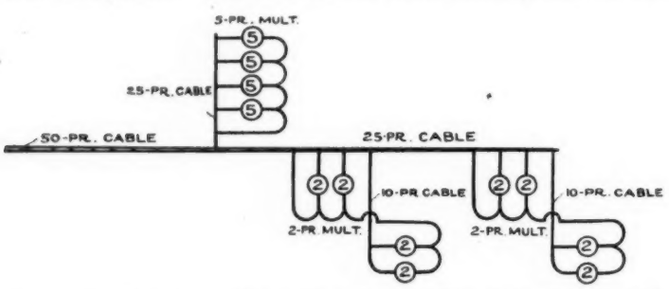


Figure 12—Fifty Pair Distribution, Twenty-Five Pair Branch Five Pair Taps, Five Multiple.

In conclusion I wish to say that the all-cable plan has two vital features that are objectionable: The breaking down of the insulation of the rubber covered twisted pair drop wire and the numerous taps necessary. These two features will be worked out. The wire companies will have to produce a more reliable insulation, and the cable manufacturers will bring out a more accessible cable. It is a business proposition to both. With these two points out of the way the demand for twisted pair wire and cable will grow enormously, and it is a business proposition to the manufacturers to do what they can to contribute to this demand. Furthermore, we are facing all-cable distribution whether we want it or not. The end of poles suitable for heavy open construction is rapidly coming into sight. Suitable material for cross arms and pins is getting very scarce, and the enormous growth in toll line construction is making vast inroads on the pole, cross arm and pin resources. The day is not far distant when we must be setting aside and saving these materials for tall work, and cable distribution will take a fresh impetus. In dwelling on some of the points in favor of all-cable work in the preceding passages, I overlooked two very important points, which are of interest. In the all-cable plant it is possible to have only one connection from the main frame to the substation protector.

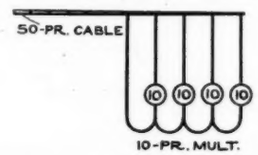


Figure 13—Fifty Pair Distribution to Ten Pair Taps.

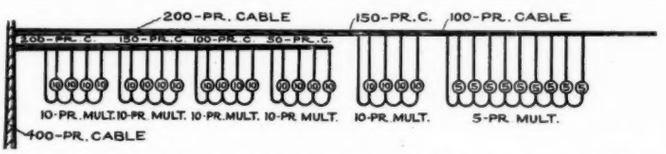


Figure 14—Examples Ten, Five and Two Pair Taps from Main or Branch Cables.

The salvage in an all-cable and twisted pair rubber covered copper distributor is at least thirty per cent as against practically nothing in the open wire system.

In closing it occurs to me that it is doubtful, after all, if I have advocated anything radical; on the contrary, I think my suggestions should rather be classified as logical.

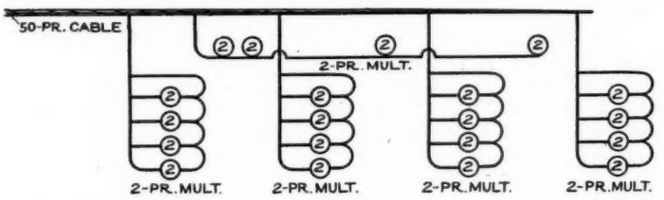


Figure 15—Fifty Pair Distribution, Ten and Two Pair Taps, Two Pair Multiple.

The specifications followed are not to be regarded as final; some detail may later need recasting. Actual practice makes many acquaintances at sight that theory did not know were in existence. The all-cable plant with us is an accepted fact, and these are the lines we will work it out on.

However, nothing will be taken down or thrown away that is at present giving service. New cable layouts will be handled after this fashion, but existing plants will stand

just as they are until their usefulness is ended, when they will be rebuilt in the newer lines or the improvements thereof.

Following are specifications for proposed method of all-cable distribution:

1. This will be a combination of direct and multiple in small units.
2. No multiple shall exceed 10 pair except by direction of engineering department.
3. Cable shall be assigned in "blocks" of 50 pair. The term "block" will be technical name for an assignment of 50 pairs and such block may be 50 feet or 5,000 feet in length.
4. If distributed in 10 pair taps, this will give four taps of 10 pair each, direct leaving 10 pair to multiple through all four taps.
5. If for 5 pair taps, this will give 9 taps of 5 pair direct, leaving 5 pair to multiple through all nine taps. (See Figure 1.)
6. If for 2 pair taps, the block shall subdivide into 10 pair sections or branches; this will give 4 taps of 2 pair each direct, leaving 2 pair to multiple through all 4 heads to each section. (See Figure 2.)
7. The present form of cable pole construction and equipment shall be discarded for general practice. And a combination consisting of a steel distributing ring, weather proof pothead and pothead bracket will be substituted. (See Figure 3.)
8. Distribution from this ring to subscriber will be by means of twisted pair No. 14 Okonite.
9. Cellar distribution shall be used wherever practicable or permission of property owners can be secured.
10. Fence distribution may be used in such cases where it might prove desirable or practicable.
11. (a). In block wiring paper core cable laid out and tapped out as outlined above shall be used, and very long runs of Okonite in bridle rings will be discontinued.
(b). The necessary runs of open wire from taps to subscriber shall be made with lead encased, paired wire, and unprotected Okonite will be discontinued.
12. Where concentration of business would demand more than the maximum 10 pair head, tap the feeder cable out in small branches to walls of adjacent building and treat as in block wiring on a small scale, each tap carrying its own individuality. (See Figure 4.) This will be made possible by proper engineering at the installation of the cable by providing sufficient excess of cable wires in congested districts.
13. At each head or tap, the direct lines will be placed on the top side of the distributing ring and the multiple shall be placed on the underside and be plainly marked "M."
14. If at any point, it should be necessary to use open wire, the top arm or arms shall be considered as the direct and the multiple shall be underneath. Multiples will always be of the same unit as the direct at each head, except for reasons given in clause 27 elsewhere in these specifications.
Example:
50 pair distributed 10 pair heads—10 multiple.
50 pair distributed 5 pair heads— 5 multiple.
50 pair distributed 2 pair heads— 2 multiple.
15. Multiple shall only be used for party lines and for overloaded poles.
16. To correctly assign cable, "spot" maps must be made of each plant before cable is planned.
17. In congested districts, the engineering department will assign cable sufficient to take care of excess business and on a 10 pair pole may be handled two ways, as follows:
The wires may be left dead in the cable or dead stubs of 10 pair each may be brought out and left to extend to nearby building walls as hereinbefore specified. In either case, they will be assigned their prospective number and placed in the records as such. This is to keep records, locations, etc., in sequence as much as possible.
18. Each cable leaving the office will assume a permanent number not duplicated again. Each cable will drop off in blocks or units of 50 pair, stepping down in size, until used up.
Each block will assume a letter of the alphabet and subdividing into ten 5 or 2 pair taps, and these taps assuming numerals in sequence, the individuality of a certain tap will thus be established.
Example:
1A4, which would mean head No. 4, block A of cable No. 1.
19. In distributing a 50 pair lead into 2 pair taps, the 50 pair shall first be subdivided into 10 pair sections, taking a letter of the alphabet in addition to the block letter of the main division. Thus, 1AA4, meaning head No. 4, a division of block A, cable No. 1, or 1AB4, meaning B. division of block A. and head No. 4.
20. All of the preceding data will be recorded in a very simple form of location and information concerning cables, taps, pins and street addresses, etc. (See Figures 5-6-7.)
21. Cable taps shall be located by street address nearest taps.
22. In all records dealing with pins or pairs, a separate ruled column will take care of the multiple.
23. For county or country work through cable of required capacity will be carried to suburbs and there opened into 25 pair boxes, equipped with fuses and carbons and without multiple.
24. For isolated communities of subscribers in subdivisions, park additions, etc., of large cities, a through cable shall be carried to a convenient distributing point and from there radiating in branches and taps as hereinbefore outlined.
25. The term "block" shall not apply to less than 50 pair and shall be used in connection with the divisions of the main cables.
26. Each cable installation shall be engineered by the home office to suit the case, as indicated by "spot" maps and data furnished by representatives.
27. If by reason of peculiar conditions, any one street be hard to properly lay out for either 10, 5 or 2 pair heads and suggest rather an irregular use of all three, a common multiple shall be decided upon by the engineers and carried through all heads of whatever direct unit.
28. In crowded districts, or those where conditions are uncertain, but rapid growth seems certain, the engineer shall carry 200 pair cable to the end of its distributing capacity, instead of stepping down in size with the finish of each block; if, in his judgment, this would save enlarging capacity on the ends of that section by stringing more cable in the near future.
29. In mapping out cable, due notice shall be taken of the transmission problem and gauge of cable governed accordingly.
30. Every pole bearing a cable head shall be plainly marked with its own number,—block letter and cable number.
31. It shall not be necessary in the beginning to make of every pole a cable pole. Space in cable and location on records will be assigned but only such heads as are needed will be opened.
32. For methods of handling twisted pair house drops, see Figure 8.
33. These specifications cover this work as a method and are not fixed or arbitrary. Every plant shall be given what that plant requires, the proper authority shall say how much shall be done, and these specifications will cover how to do that much. The above specifications are general and for use of proper engineers only.
Following this will be found detail or subsidiary specifications.

ASSIGNING CABLES INTO BLOCKS.

1. If beginning with 400 pair.

The	shortest	block	shall be	350 to 400
2nd	in	length	" "	300 to 350
3rd	"	"	" "	250 to 300
4th	"	"	" "	200 to 250
5th	"	"	" "	150 to 200
6th	"	"	" "	100 to 150
7th	"	"	" "	50 to 100
8th	"	"	" "	1 to 50

ASSIGNING BLOCKS INTO HEADS.

2. If for 10 pair heads. (See Figure 9.)

Tap No.	1 pairs	61 to 80
"	2 "	41 to 60
"	3 "	21 to 40
"	4 "	1 to 20

Multiple common to all 81 to 100.

ASSIGNING BLOCKS INTO HEADS.

3. If for 5 pair taps.

Tap No.	1 pairs	81 to 90
"	2 "	71 to 80
"	3 "	61 to 70
"	4 "	51 to 60
"	5 "	41 to 50
"	6 "	31 to 40
"	7 "	21 to 30
"	8 "	11 to 20
"	9 "	1 to 10
Multiple pairs		91 to 100

4. For distributing a block of 50 pairs into 2 pair heads where it does not branch, it is thought best to subdivide, both for convenience and for getting a larger amount of multiple in the total length. Subdivision in groups of 10 pair will bring this about, and wires shall be assigned as follows:
Take Block "A" for example: (See Figure 10.)

Aa—Tap No.	1 pairs	93 to 96
"	2 "	89 to 92
"	3 "	85 to 88
"	4 "	81 to 84
Multiple		97 to 100

Ab—Tap No.	1 pairs	73 to 76
"	2 "	69 to 72
"	3 "	65 to 68
"	4 "	61 to 64
Multiple		77 to 80

Ac—Tap No.	1 pairs	53 to 56
"	2 "	49 to 52
"	3 "	45 to 48
"	4 "	41 to 44
Multiple		57 to 60
Ad—Tap No.	1 pairs	33 to 36
"	2 "	29 to 32
"	3 "	25 to 28
"	4 "	21 to 24
Multiple		37 to 40
Ae—Tap No.	1 pairs	13 to 16
"	2 "	9 to 12
"	3 "	5 to 8
"	4 "	1 to 4
Multiple		17 to 20

5. Laying out of cable on main frame shall be after the following manner (see Figure 11.)
Cable shall be opened and laid in main frame, taking great care to keep layers intact. Then beginning at heel of cable and counting from left to right, take off 50 pair, and distribute to bar in regular sequence from 1 and 2 to 49 and 50, the latter being the nearest the heel of the cable. In a like manner, take off another 50 pair and distribute to next block with highest number towards heel of cable and so on, following completely around each layer, until used up and breaking into next layer where last one finished, until cable is all distributed.
6. In making splices, straight away or branch, this same arrangement shall be kept in mind; splicing by layers and keeping position of individual pairs straight and tapping outside layers till used up. This idea must positively be carried out, as it will facilitate all the work of opening and tapping cables, and will decrease liability of trouble that arises from ordinary methods of digging through outer layers of pairs to get out those that may be in center of bunch.

ASSIGNMENT OF CABLE IN BLOCK WIRING.

1. Cable of sufficient capacity shall be carried into the district to be reached. This may require any number of blocks of 50 pair. Once into the district, it branches from terminal point in sizes required and from these branches, taps shall be made where a cluster of subscribers may be reached with the shortest runs of lead encased pairs and in heads that will allow a per cent of growth. (See Figures 12-13-14-15.)
2. Cable so distributed will be carried around the walls at convenient levels and in such manner as to cause no trouble or inconvenience to property owners and looking also to the safety of the cable.
3. Cable shall be secured to the walls by lead straps 18 inches apart and secured by nails, shall be suitably covered by pipe or boxing in exposed places and wherever carried across gap caused by difference in height or length of buildings shall be carried on messenger of required size and secured to buildings.
4. In assigning cable to office buildings, if building is a small one, sufficient cable shall be carried into building to serve every room and shall terminate at nearest possible point to a common center in radiating to all rooms.
5. In assigning cable to large office buildings of many stories and large floor space, cable of required capacity shall be carried to basement and, beginning there, each floor may be considered a separate community, and combined direct and multiple taps brought out of the feeder cable, carried up the shaft for such purpose. This class of buildings will probably call for treatment specified in clause 27, general specifications attached.

CHANGING HEADS FROM ONE CABLE TO ANOTHER.

If at any time a subsequent arrangement is called for, or demand creates new heads in a block of cable, materially altering arrangement of its initial installation, or new heads should be cut in between existing heads and office other than were planned for, at the installation, it will be necessary to change block letter and tap numeral and street location of such heads to restore sequence of numbers in records,—in other words, a tap may be changed as a cut is made in open wire construction, care being taken to note same in all records bearing on taps and to have its pole marking changing to conform.

MAKING BRANCH TAP FROM OVERLOADED POLE TO BUILDINGS.

1. Permission from property owner having been obtained, a suitable eye bolt shall be fastened to the walls, preferably by expansion bolts and a light messenger carried across from main messengers and at the same level and if possible, at right angles to route.
2. Cable shall then be carried to the selected distributing point on face of the wall, fastened at every 18 inches with lead cleats, and running in vertical and horizontal lines.
3. The distributing rings used for house work shall be attached to the wall with expansion bolts and in the least conspicuous position, preferably behind signs or projecting cornices, if on front walls; if on rear or side walls, this will not matter, but the idea of neatness and sightliness must always be had in mind.
4. From the distributing head, lead encased single pairs will be run, concealed as much as possible, to the surrounding subscribers.
5. In this and all other points in this cable plan, it will be the aim to reduce to the smallest unit the amount of individual wire or pairs carried anywhere by bringing them in each case to a point where the required number of sub-stations can be reached with the shortest runs of wire.

OFFICIAL BULLETIN NUMBER ONE

The First Announcement of the New President of the International Association

By Theodore Gary

THE new fiscal year of the association opens with prospects bright and encouraging. Never in the history of the movement have the various interests of the Independent telephone industry worked together so harmoniously as at present. The operators, investors, manufacturers, supply men and publishers are determined, apparently, to stand as a unit for all time to come, dominated by the idea that what is good for one is good for all.

In view of this happy state of affairs, the new administration enters upon the performance of the trust committed to its care by the unanimous vote of the association, in convention assembled, with enthusiasm and a determination to boost the telephone business, and with the conviction that the coming year will be not only one of wonderful physical development, but also one of unprecedented ethical progress.

THE INDEPENDENT SPIRIT.

In various sections of the country the Independent operators have rejected, with commendable unanimity, traffic overtures made by the opposition. The Independent spirit has dominated, everywhere, the action of individuals and state associations, and not one break in the ranks has been reported from the Atlantic to the Pacific since the International convention in Chicago. It will be the aim of the new officers to still further develop this feeling of unity, which, coupled with a demand for telephone service supplied in a popular way, has made the Independent telephone industry one of the greatest industrial factors in the United States and Canada and has given to the people of these countries a telephone service which, in efficiency and economy is without an equal in the world.

NEW EXECUTIVE COMMITTEE.

Your president has, after mature deliberation, and with the approval of the advisory board, appointed the following executive committee:

W. B. Woodbury, Detroit, Mich.; O. C. Snider, Kansas City, Mo.; J. B. Hoge, Cleveland, Ohio; G. N. Bandy,

Des Moines, Iowa; A. C. Lindemuth, Richmond, Ind.; W. E. Doolittle, Lafayette, Ind.

None of these gentlemen needs an introduction to members of the association. All are known throughout the length and breadth of the land as men who have given much of their time and talents to the cause in various lines, and your president congratulates himself and the association upon having secured their co-operation and assistance in disposing of such problems as may arise from time to time. Chicago being easily accessible to all from their respective places of residence, should insure good attendance at committee meetings.

REMOVAL OF HEADQUARTERS.

It has been decided to remove the headquarters of the association from Cleveland, Ohio, to Chicago, Illinois, the latter city being located more centrally and also more easily reached from every section of the country. The fiscal and industrial importance of the Independent telephone business rendered it advisable to locate the executive offices either in New York or Chicago, and the final choice fell on the latter city on account of the fact that it is, at present, the center of Independent development. However, the headquarters will remain at Cleveland until arrangements have been completed for transferring same to Chicago, due announcement of which will be made.

Charles West, secretary-elect, will not take active charge, but J. A. Harney, the assistant secretary, will perform the duties of secretary.

MORE PUBLICITY.

While no definite plans have been made for the year's work, it can be stated, nevertheless, that particular attention will be paid to spreading the gospel of Independent telephony and boosting the telephone business generally by means of newspaper and magazine publicity. The importance of our business is not yet understood by the American public, who must be educated to realize the extent of the industry. Very few understand the magnitude of the investment required, the service it renders to the people and the legitimate profit it pays to investors. Money invested in publicity will benefit every Independent operator, by creating a demand for his securities and his service. While the association's publicity service will be national in character, yet attention will be paid to sectional needs, wherever necessary.

READING NOTICES.

Under the management of the publicity department, suitable write-ups on almost any subject pertaining to Independent telephony will be furnished free of charge to members for reproduction locally.

Write the secretary of the information wanted. Generally the matter furnished will be so prepared that local papers will gladly publish same as news items.

BOOM FOR TELEPHONE BUSINESS.

Let everybody talk up the good points in the telephone business.

MONTHLY FINANCIAL STATEMENTS.

Commencing with Bulletin No. 2, a monthly financial statement will be published, showing the fixed charges, state of the treasury, assessments, receipts and disbursements of the association.

MANAGERS.

Look for the shield stamp on all telephones and switchboards purchased. It is an assurance that the manufacturer is contributing to the support of the association.

ASSOCIATION TO INCORPORATE.

The association will be incorporated at an early date by the advisory board, with a nominal capital, and the articles of association will provide that it shall not be run for profit.

SUPPLY DEPARTMENT TO BE DISCONTINUED.

The association has decided to discontinue the supply department as soon as the stock of "Shield" supplies, now on hand, can be closed out. This stock consists of colonial lanterns, standard toll signs, large and small transparencies, inside celluloid toll signs, cardboard toll signs for construction work, gold-plated emblems, celluloid buttons, and "Shield" electrotypes for one and two-color printing.

Customers who have dealt with the association in the past know that the goods handled by it have always been of the best quality, unsurpassed in design and lasting properties. The discontinuance of the supply department offers them an opportunity of procuring "Shield" advertising essentials at reduced prices. Managers who have hitherto failed to give "Shield" advertising a trial can now participate, at a minimum cost, in the advantage of this mode of pushing and individualizing their business. The association has never aimed to make money out of its "Shield" supplies. It has bought goods in large quantities and sold them at a slight advance to the Independent operators.

BARGAINS IN "SHIELD" SUPPLIES.

In order to close out the department without unreasonable delay, it has been decided to dispose of the stock on hand, which is fresh, clean and first-class throughout, at a substantial discount from previous prices—in other words, at figures much less than the individual buyer could obtain otherwise. As this is an opportunity that will not be open very long, managers and individuals are advised to act at once. No new goods will be purchased by the association and orders will be filled in order of their receipt. From the latter rule there will be no deviation. Price list and further particulars about discounts may be obtained upon application to the general office at Cleveland, Ohio.

MAP WORK HELD IN ABEYANCE.

The map department has been discontinued for the time being. This branch of the association's work has accomplished the purpose for which it was created, but has been left in such shape that it can be revived at a moment's notice, should occasion require.

CHRONICLE DISCONTINUED.

The publication of the Chronicle has been discontinued. Settlement for unexpired subscriptions and paid-in-advance advertisements will be made in due time.

1907 CONVENTION PROCEEDINGS.

All desiring copies of the last annual convention proceedings will please write the assistant secretary at once, stating number wanted. This information is necessary in order to provide a sufficient number of copies for distribution.

We have some of the 1906 report nicely bound, which will be mailed free on application, as long as the supply lasts, on receipt of seven cents in stamps for postage.

HONORARY MEMBERS.

Since the last report has been issued to the press, D. A. Walker, Columbus, Ohio, and E. L. Swaine, Los Angeles, California, have qualified as honorary members of the association.

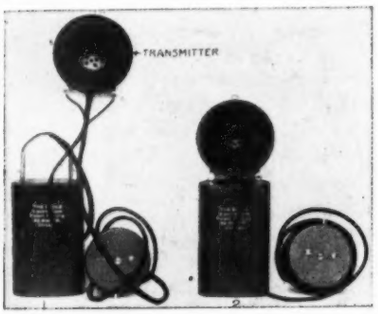
WINS AN IMPORTANT SUIT.

La Compagnie de Telephone Nationale, the strong Independent company of Levis, Quebec, of which George Demers is president, and Dr. J. F. Demers is secretary-treasurer, has won an important damage suit in the superior court of Rimouski. Last fall suit was begun against the company for $10,000 damages by the parents of a child which sustained injuries from a box of detonators. The child found the box on the highway near where the telephone crew was working, and opened it, an explosion resulting which cost the boy both hands and an eye. The case was heard and the court dismissed the action, as the plaintiff failed to prove the liability claimed.

MANUFACTURERS DEPARTMENT

THE STOLZ ELECTROPHONE.

For the past ten years the gentlemen comprising the Stolz Electrophone Company, of 92 State street, Chicago, have been engaged in the development of apparatus which will enable the deaf to hear, and they announce that their efforts have at last been crowned with success. The Electrophone, as their device is called, is a miniature type of telephonic apparatus which may be carried about and used without attracting undue attention to the user.



It consists of two parts, a transmitter and an ear-piece, and weighs complete but about 12 ounces. The transmitter contains the batteries and fits into the average size vest-pocket, or may be slipped into the waist. The transmitter is of globular carbon and by varying the amount of globulars in the electrode, Electrophones of various tones result. These globular carbons are made in different sizes and the diagrams of different thicknesses in order to get instruments of different tones to fit the varying degrees of deafness. It is also necessary to make the magnets of various resistance in order to get the proper current for the different tones.

The Electrophone is to the sound wave what X-ray is to light. It combines telephonic with microphonic principles, so that when sound waves strike the transmitter, the quality and timbre of the sound is made far more penetrating. An ordinary sound wave is undulating. The sound wave conducted to the ear by the Electrophone is changed so that it becomes angular and sharp.

These angular sound waves strike sharply against the hearing nerves and force sounds to the brain that would otherwise be unintelligible. This exercise given to the dormant and dying hearing nerves in many cases leads to a perfect restoration of hearing. In all cases of catarrhal deafness regardless of time (providing the aural nerve is still alive) the patients can hear with the Electrophone and in time many are so improved that they are able to go to church, theater and social gatherings with as much enjoyment as any person.

In brief, it is claimed that the Electrophone is one of the practical inventions of the age—a successful commercial proposition in every respect. It will commend itself readily to experienced telephone men and the manufacturers invite particular attention at their hands to its especially sensitive transmitter—a distinct type never before produced by any manufacturing concern. For the individual use of deaf persons the Electrophone is pronounced a blessing, dispensing as it does with speaking tubes, ear drums, trumpets, etc. The Stolz Electrophone Company is seeking to introduce its apparatus through the medium of a good telephone man in each locality, and announces that it is prepared to make a very attractive offer. The firm also makes a type of apparatus adapted for use in theaters, churches, etc. Detachable ear-pieces are supplied, so that when deaf persons visit the church or theater, they merely insert the plug of the ear-piece into a little receptacle and listen to the sermon or play with as much pleasure as any person with normal hearing in the audience.

W. C. CHURCH LUMBER & COAL COMPANY.

The W. C. Church Lumber & Coal Company, Des Moines, Ia., has rapidly acquired a fine trade and reputation throughout the telephone field. This firm's specialty is select white cedar poles and its facilities have successfully withstood all of the severe tests to which they have been subjected thus far. In a booklet recently issued the concern presents some very interesting statements and illustrations, a part of which are presented herewith.

The W. C. Church Lumber & Coal Company is officered by W. C. Church, president and general manager; F. L. Townsend, vice-president; W. K. Jones, secretary, and J. D. Whisenand, treasurer. Its offices are in the Manhattan building, Des Moines, Ia., and its yard are at Lammer's Spur, McCarty's Spur No. 2, Shook's River, Spur 144, Gemmell, and Turtle River, all on the Minnesota and International railway.

The company owns its own cedar lands and does its own logging. Its headquarters are located in the heart of the consuming country, giving it many advantages as well as making it possible to promptly and easily adjust any differences that may occur. Its numerous yards also give it the certainty of getting cars at one or the other quickly. Furthermore, Mr. Church says: "We produce what we sell and ship what we invoice. We own our own land and cut the timber in season, thereby producing the best cedar."

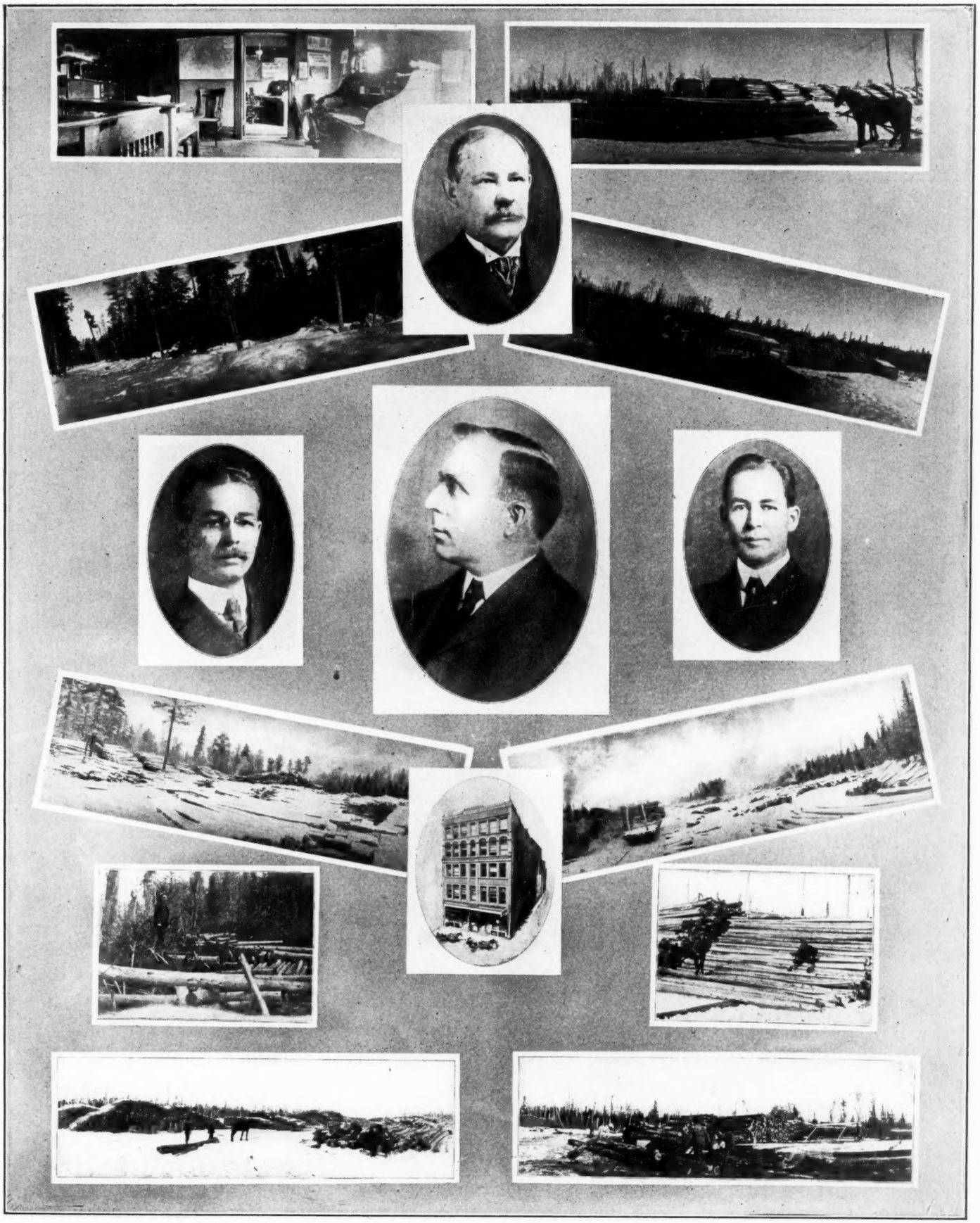
The views on the opposite page were taken this spring, and give the reader a fair idea of the scope and magnitude of the company's operations. Greater things are planned for the future and the firm has recently incorporated and increased its capital to buy more standing timber, so as to insure a business for future years while down to minimum cost.

Conservative estimates place the total supply of white cedar timber sufficient to meet the demand for only about ten years. Competition amounts to the survival of the fittest, and the Church company wants to be prepared to stay to the finish.

Out of the stock reservation made for dealers, only a few shares of preferred stock remain unsold. These the company is offering to its customers—dealers in cedar—in lots of one to five shares, of $100 each, par value, distributing it over several states in which it does business, issuing preferred stock, with a fixed dividend of ten per cent per annum, redeemable at par after two years. In addition, each share will have a purchasing power of $500 of cedar products upon which a special stockholder's discount of five per cent will be given, in lieu of cash discount, on the price established by the competitive market. The reason for making this proposition is stated as follows:

"We can borrow money for less than our guaranteed rate, but we do not need your money as much as we need your trade and influence—a volume of business with an assured source of supply. It costs all we offer in dividends and discounts to sell our cedar, but where we place the stock among dealers the goods sell themselves, insuring us a ready market for our products. Stockholders realize the selling expense thus saved."

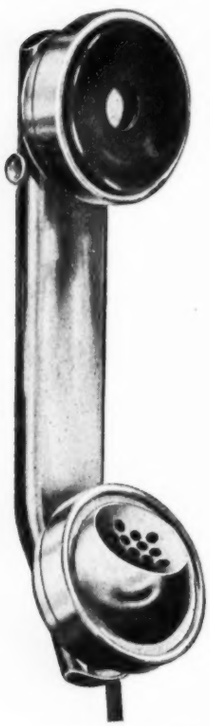
It is understood that Mr. Church and his associates are succeeding with these plans as well as building up a large trade generally throughout the telephone field.



The W. C. Church Lumber and Coal Company, Showing the Building Occupied by the Company, Its Officers and Views in Its Cedar Yards. The President of the Company, W. C. Church, is Shown in the Center Photograph, with J. D. Whisenand, Treasurer, Immediately Above Him; W. K. Jones, Secretary, is to His left, and F. L. Townsend, Vice President, is to His Right.

LINEMAN'S TESTING TELEPHONE.

The "all metal" combination telephone just placed on the market by the Stromberg-Carlson Telephone Manufacturing Company will be recognized by discriminating exchange managers as a high-grade lineman's testing telephone. Until now most linemen have been compelled to use some forms of rubber encased microphones, bound with insulating tape and arranged in various ways for satisfactory outdoor use.



The construction of the No. 6B central energy combination telephone is simple, neat and particularly strong. Moisture cannot get into any of the parts. The frame or handle is made of seamless brass tubing drawn especially for this design and is so strong that it is impossible to bend or dent it. The regular solid-back transmitter electrodes are enclosed in a case, consisting of three pieces mounted directly on the frame by large screws. The perforated cast brass mouthpiece and clamping ring hold the diaphragm and diaphragm spring in place. The receiver is the regular operator's type in a specially designed case, having all exterior sides and edges of metal to prevent breaking the ear cap, which is enclosed as much as is practicable. A transmitter cut-out button is arranged just opposite the receiver for convenience or preventing the annoyance of side tones taken up by the transmitter when listening in on the line in a noisy place. The construction is rigid and free from sharp edges or corners. Both the transmitter and receiver interior parts are accessible by unscrewing the clamping rings. All parts are thoroughly insulated and heavily nickelplated and a green silk braided tinsel two-conductor cord, equipped with snap clips, is furnished to enable immediate and sure connections, as is usually required with an instrument of this kind. The complete instrument is not more than eight inches in length and may be carried in the pocket. The same form of instrument is furnished by the Stromberg-Carlson Telephone Manufacturing Company with its Nos. 841, 842 and 843 generator call lineman's test set including generator, batteries, etc. The demand and suggestions received for a suitable testing instrument for central energy service caused the development of this No. 6B combination telephone. Descriptive matter will be sent to all interested parties.

WHAT IT DOES AND DOESN'T.

H. H. Woodworth, of the sales department of the Automatic Electric Company, Chicago, is mailing out the following very convincing letter to telephone men:

"Dear Sir: This little machine makes your telephone connection automatically and instantaneously. It has fingers but no ears, it can't 'rubber,' nor tattle, nor flirt, nor gossip; it has all the virtues (and more), and none of the faults of 'Central.' It does not have to be paid a salary, nor kept warm, nor have a light to work by; it never 'talks back' nor goes on a strike; it is never sick. It takes up very little room, and it attends strictly to business. It helps any telephone company to make more money and spend less than any manual equipment ever did or could. It is the automatic switch. It and its assistant, the automatic telephone, are the highest development of telephonic science and genius, and the greatest money-makers in the telephone operating business. Independent telephone companies all over the country are adopting our automatic telephone system, the new ones to enable them to start right, the old ones—'better late than never'—to make up their past losses and take their places among the progressive ones. If you are interested in bettering your service, lessening your expenses and increasing your profits, it will pay you well to thoroughly acquaint yourself with the automatic telephone system."

LONG DISTANCE TELEPHONE MANUFACTURING CO'S NEW SALES MANAGER.

The Long Distance Telephone Manufacturing Company of South Bend, Ind., has been fortunate in securing for its new sales manager H. P. Didriksen, who for some years past has been one of the best known and most successful sales managers of the telephone field. Mr. Didriksen, if memory serves right, started in the telephone business with the Eureka Telephone Manufacturing Company at Chicago, afterward going with the Chicago Telephone Supply Company at Elkhart, and later with the Wesco Supply Company at St. Louis. He has the reputation of being one of the best posted, most energetic and most successful sales managers of the telephone field. It is predicted that he will score another success in his new location.

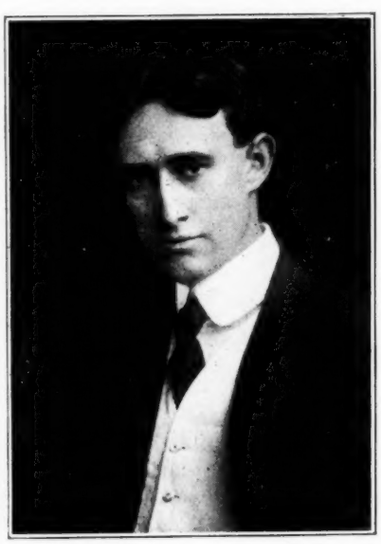
H. P. DIDRIKSSEN.

GENUINE "TROUBLE" LINE.

To avoid a personal conference the Shah has had a telephone line built from his palace to the public square for the use of subjects having grievances to present. When he gets enough troubles for one day he gives the "busy" signal. The Czar might profitably employ a few thousand miles of wire in the same way.

GEORGE T. WESTCOTT'S NEW AGENCY.

George T. Westcott, who for some eighteen years has been a well known member of the Western Electric Company's purchasing department, recently opened offices in the Chamber of Commerce building, Chicago, where he will represent a number of different manufacturers of telephone and electrical supplies, including hard and soft rubber specialties (hard rubber sheet, rod and tube), telephone cabinet work, construction materials, all kinds of wire, insulating material, etc. From his long experience with one of the largest organizations in the world, Mr. Westcott is not only especially well qualified to handle such articles intelligently and economically, but appreciates the importance of making prompt deliveries, which will be a special feature of his policy. Those who have followed Mr. Westcott's career with the Western Elec-



GEORGE T. WESTCOTT.

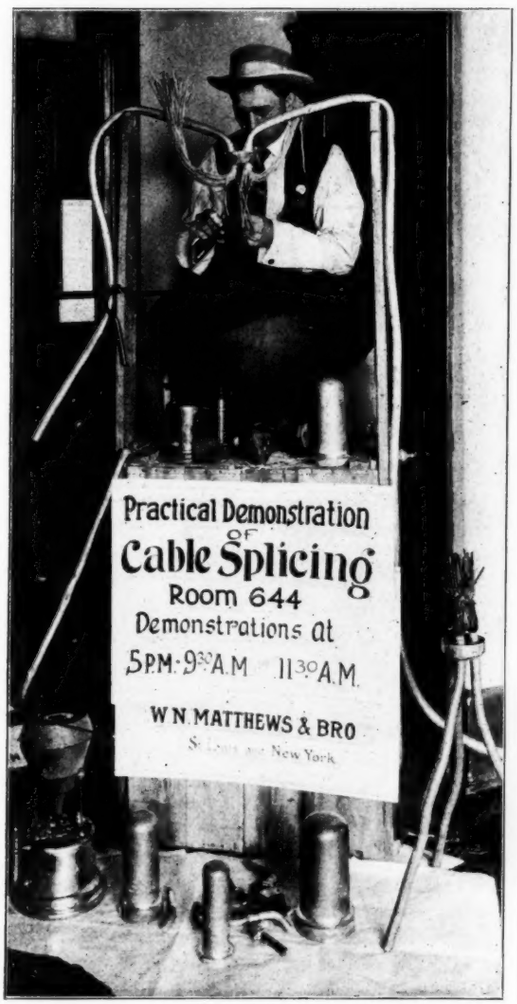
tric Company know him personally as a courteous, capable business man, and confidently predict success for him in his new line of work.

AUTOMATIC TELEPHONE INDEX.

Wm. G. Johnston & Company, of Pittsburg, Pa., handle a number of good telephone specialties, including the Automatic Telephone Card Index. This index enables one to call instantly for parties desired, as they are alphabetically arranged and immediately before the eyes of the speaker. These cards are durable and easily removed to permit of any alterations or additions. Samples and prices will be furnished upon request.

DEMONSTRATING HARGIS JOINTS.

One of the most interesting exhibits at the recent International Telephone Convention was a practical demonstration of the Hargis cable splicing joint. This device is designed to do away with the old-fashioned wiped sleeve. It was shown at this exhibit that anybody who is able to make tin stick to brass is able to make an absolute moisture proof joint by means of the Hargis cable splicing joint, demonstrations being given to the delegates every half hour by Mr. O. K. Johann, who represented the manufacturers. These demonstrations proved so successful that the manufacturers decided to send Mr. Johann throughout the country to show telephone managers how the Hargis joints can be used to advantage and explain their various points of merit. Mr. Johann will cover Iowa first, and was busy installing a large quantity of Hargis joints for the Martin Telephone Company of Webster City, Iowa, between the 20th of June and the 1st of July.



Demonstrating Hargis Joints.

Anyone interested in having Mr. Johann call on them should write to W. N. Matthews & Bro., 210 North Second street, St. Louis, who are the manufacturers of this device.

LATEST TYPE OF RECEIVER.

The Illinois Specialty Manufacturing Company, Chicago, has for some years past made a specialty of manufacturing telephone receivers, and it is claimed that in all of that time and out of all the thousands of receivers which the concern has sold into everyday use, the percentage of defective instruments has been smaller than with any similar type of apparatus yet produced.

This season, the company, signifying its intention to keep up-to-date as well as thoroughly reliable, has brought out an improved model, which is meeting with great favor among the largest and most careful buyers. On account of its construction and the quality of materials employed, it is claimed that this new-style receiver will talk more distinctly, "stand up" longer, endure more rough usage and prove better adapted to varying requirements than purchasers have heretofore been able to procure.

The price also will be found a tempting feature of the new receiver. Buyers, who contemplate the purchase of such equipment, now or in the near future, are invited to send to the Illinois Specialty Company for samples and quotations.

THE W. C. STERLING & SON COMPANY.

The pioneer cedar pole producers, W. C. Sterling & Son Company, continue to increase their facilities. From a Monroe (Mich.) paper TELEPHONY takes the following excerpt:

"Last week the W. C. Sterling & Son Company announced the establishment of a pole yard in this city, the location being on a site 1,500 feet long adjoining the Michigan Central tracks. * * * The firm maintains a number of other yards, the principal one being at Bay City, where it has 130,000 poles, making it the largest yard in the state. In fact this company and others in which it holds a majority stock, practically control the cedar supply in the lower peninsula, and W. C. Sterling, the head of them all, is now in many sections styled the 'cedar king.' * * * The yards at Monroe were made necessary because of the impossibility of getting enough cars at Bay City to ship in and out the immense cargoes of timber and poles. Seventy cars are now under way to Monroe and an equal number will follow shortly. There will as a rule be between 20,000 and 30,000 poles kept on hand here. * * * The firm's growth has been wonderful. It was started twenty-seven years ago by W. C. Sterling, whose one aim always was to give the best goods to be had for the money. * * * How far-reaching their business is may be seen from the fact that they have timber lands, mills or yards in nineteen counties besides Monroe—Missaukee, Clare, Mackinac, Roscommon, Kalkaska, Tuscola, Bay, Arenac, Iosco, Algona, Alpena, Presque Isle, Cheboygan, Charlevoix, Otsego, Crawford, Ogemaw, Gladwin and Wexford."

TRADE NOTES.

THE H. B. CAMP COMPANY, Chicago has just issued a new line of attractive folders on the subject of Camp conduits which will be sent free to all interested parties.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING Company, Rochester and Chicago, has some attractive post cards which will be furnished free to its friends and customers.

TELEPHONE MEN interested in storage batteries for their central energy systems will be interested in the new catalogue just issued by the Zoar Storage Battery Company, of Zoar, Ohio.

O. F. FRENCH, formerly general manager of the Cuyahoga Telephone Company, of Cleveland, Ohio, has been appointed deputy minister of telephones, telegraphs and railways for the province of Manitoba. He will direct the construction of municipal and government owned telephone lines.

THE CLAY PRODUCT COMPANY, Chicago, Ill., and Brazil, Ind., has issued a very attractive catalogue, showing several new designs in clay conduit which are intended to be economical for the consumer. The catalogue also includes considerable valuable information on the manufacture and laying of conduit.

THE AUTOMATIC ELECTRIC COMPANY, Chicago, pulled off another good advertising "stunt" last month when it published a fac simile reproduction of the telegrams received by Mayor McClellan of New York City regarding Automatic apparatus. Copies of these telegrams in bound form can be had for the asking.

W. O. RHODE, formerly manager of the Swedish-American branch house at Kansas City, Mo., has been appointed manager of the Century Telephone Construction Company's branch, which was opened July 1st at 408 Delaware street, Kansas City. The Century company will carry a full line of supplies and telephone apparatus at its Kansas City branch to supply the southwestern trade.

THE WEINSHEIMER COMPANY, recently incorporated in Chicago, with offices in the Monadnock Block, announces that it has taken agencies from Machado & Roller for the Whitney electrical instruments and from the Leeds & Northrup Company for its electrical measuring instruments. W. E. Weinsheimer is president; P. R. Fisher, vice-president, and E. Switzer, secretary and treasurer.

AN UNUSUALLY ATTRACTIVE ADVERTISING souvenir has been put out by the Vote-Berger Company, of LaCrosse, Wis., in the shape of a handsome celluloid and metal calendar which is so arranged as to be perpetual. "They stay put" is the motto of the Vote-Berger Company in describing its two ball adjusters for incandescent lamps, and the calendar demonstrates the same principle. The souvenir is one of the neatest issued this year.

THE ROCHESTER SEWER PIPE COMPANY, Rochester, N. Y., is mailing out post cards presenting the following points of superiority claimed for its conduit: Thoroughly glazed and vitrified; smoothness of inner surfaces, preventing injury to cables; absolutely no defects; square and straight—connections perfect; clays thoroughly ground and tempered; heat controlled by electrical pyrometers guaranteeing proper curing of the ware, good vitrification and and thorough salt glazing.

BAY STATE INSULATED WIRE AND CABLE COMPANY, Hyde Park, Mass., announces the completion of its extensive new wire mills, and states that it is now ready to manufacture insulated wires and cables of every description. The capacity of the mills is at present 500,000 feet per day; with additional machinery under construction that will enable the company to turn out twice as much work. The president, Mr. Andrew J. Conlin, was for the past eighteen years superintendent of the plant of the Simplex Electrical Company, at Cambridge, Mass., and, having held other positions of importance in the manufacture of insulated wire, is looked upon as an authority in this particular line. The treasurer and manager, Mr. John H. H. McNamee, formerly mayor of Cambridge, Mass., will look after the company's financial and business interests. Mr. Alfred W. Worthley is in charge of the sales department, which he will be well able to handle, having been associated formerly with the Eastern Electric Cable Company. The company intends to furnish its customers only the best of material, prompt deliveries and reasonable prices. It will be pleased to answer all inquiries.

TELEPHONE RULES IN AUSTRALIA.

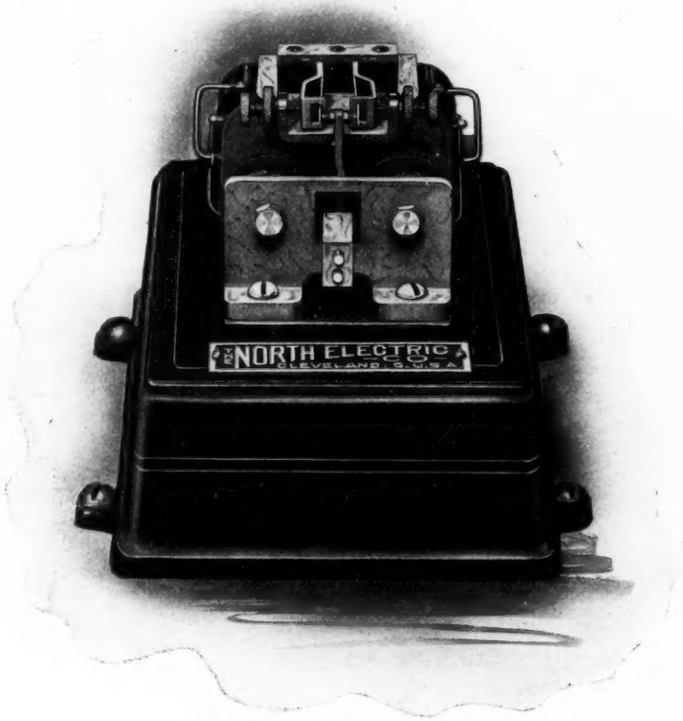
Australia is a long distance from the United States, but the telephone exchanges in the antipodes are adopting some of the regulations in vogue here. Instead of the operator saying that the line of a called party is "busy," however, the Australian operator says "engaged," which is not so terse and business-like as the Yankee phrase. The telephone system in Australia is under the control and direction of the Colonial postal authorities, which have issued rules governing the service. The instructions say: "Telephone attendants should, when answering a call, give the name of the exchange only, and repeat the exchange and number required when such have been given. In the event of the number asked for being engaged, the reply should be 'three four five' (or other number, as the case may be) 'engaged.' When repeating numbers, attendants will invariably say the word for each figure. The cypher or zero (0) will be designated 'Oh,' and not 'nought,' 'aught,' or 'nothing.' A repeated figure must be indicated, as 'double ——.' Thus, 2243 must be repeated as 'double two four three.' Thus, following examples will indicate the correct method: 4235, four two three five; 4000, four thousand; 4111, four one double one; 4226, four double two six; 400, four double oh. If subscribers and others using the telephone will also adopt the foregoing method of giving the required numbers to the exchanges, any misunderstanding or unnecessary discussion will likely be prevented."

Here's an odd story from the Pacific coast. Because February was a short month the Sunset (Bell) Telephone Company "docked" operators in the Seattle exchange—and would not give them a full month's pay—and many of the company's patrons, learning of this policy, when the telephone bills were sent around, refused to pay the regular rate, insisting on a corresponding reduction. Dr. R. L. Chase is one of these. When the collector presented his bill the physician made the reduction and his reply to the protest was that if the company did not like it, it could take out the telephone. Similar tactics were employed by others, to the great gratification of the telephone girls.

NORTH SYNCHROMONIC SYSTEM.

One of the most interesting exhibits shown at the Chicago convention, June 4, 5 and 6, was the North synchromonic system shown by the North Electric Company, of Cleveland, Ohio. While this system bears some relation to the harmonic selective systems, with which the telephone public is more or less familiar, it is still fundamentally different from them in that the several frequencies employed for ringing do not bear a harmonic relation to each other, but on the other hand each of the frequencies employed is at discord with any other frequency. Aside from this the design of the apparatus is radically different from anything heretofore seen in the harmonic line.

In a synchromonic four-party system, the frequencies used are 30, 42, 54 and 66 cycles per second, while in an harmonic system the standard frequencies are 16 2-3, 33 1-3, 50 and 66 2-3 cycles per second. Reduced to their lowest terms, it will be observed that the synchromonic frequencies bear the relation to each other of 5, 7, 9 and 11, while the harmonic frequencies bear the relation to each other of 1,



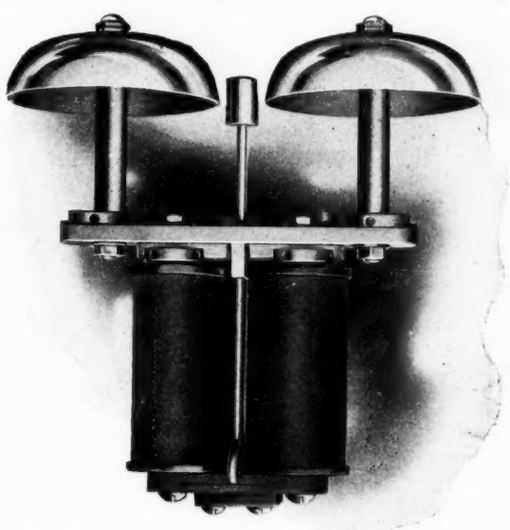
Vibrator or Pole Changer.

2, 3 and 4. One of the chief difficulties heretofore encountered in the operation on the harmonic system has been due to the liability to cross ring. This tendency has been particularly noticeable between the 16 2-3 and 50-cycle ringers. Upon analyzing the waves to the various cycles, the reason for this interference is quite obvious.

The laws governing the vibration of synchromonic and harmonic ringers, vibrators, or pole changers are the same as those governing the vibration of musical reeds or springs. It is well known that if a reed of any pitch or frequency is vibrated all other reeds in close proximity to it which are either in synchronism or harmony with the reed vibrated are caused to vibrate. This is called sympathetic vibration and is most pronounced between two synchronous reeds, as between these two reeds perfect harmony exists.

Next in matter of harmony is the octave, or where one reed vibrates twice as rapidly as the other, afterward follows the fifth with a ratio of 2 to 3. It will be observed by reference to the ordinary harmonic frequencies that we have the ratio both of octaves and fifths between the several frequencies and when a current of any given frequency is impressed on the line, it naturally follows that any ringer in synchronism with the ringing current will respond, and it also follows that any ringer in harmony with the impressed current will respond to a greater or less degree, depending upon the ratio of the coincidence. In order to overcome the difficulty due to these harmonic frequencies and consequent cross ringing, the factors of impedance, resistance, and capacity have been introduced, but the results have not been by any means satisfactory. It is also customary to employ different voltages for the different frequencies. Harmonic ringers are usually wound as follows: 16 cycle, 2,500 ohms; 33 cycle, 500 to 2,250 ohms; 50 cycle, and 66 2-3 cycle, 500 ohms each. In order to avoid cross ringing extremely accurate adjustment of the ringer is required, and in order to meet the demands in this direction, a micrometer adjustment is usually employed. It is also essential that the condensers used in series with the ringers are of uniform capacity.

In the case of the synchromonic system it will be noticed, as stated above, that the frequencies employed bear the relation of discords to each other, and by using these frequencies, the element of sympathetic vibration is eliminated. All synchromonic ringers are wound to a uniform resistance of 1,000 ohms, and a variation in condenser capacity is im-



Synchromonic Ringer.

material. In a four-party synchromonic system the lowest frequency employed is that of 30 cycles, and the ringer adjusted to this frequency cannot be made to respond to the ringing from a hand generator, although this frequency is sufficiently low so that an ordinary alternating current ringer will respond to it. We illustrate herewith the synchromonic vibrator or pole changer and ringer. By reference to the cut of the vibrator or pole changer, it will be noticed that it has but two make and break contacts, and these are in a position making them easy to adjust, and they can be readily replaced, should they become worn out. These pole changers are given a wide amplitude and the circuit is such that as the load upon any converter is increased, the amplitude of its vibrator is increased. This causes the primary circuit of the transformer to be closed an increased length of time, allowing the transformer more time in which to build up, and in consequence there is less drop in the voltage of the secondary current than in the case of a vibrator having a uniform amplitude. When these vibrators and transformers are working on no load the current consumption at 24 volts is approximately 1-10 ampere per vibrator.

By reference to the cut of the synchromonic ringer, it will

be noticed that it is very massive and substantial in construction. The adjustment of the pole pieces is very easily and quickly accomplished by means of the eccentric shown, and the gong posts are adjusted in like manner. The vibrating reed is composed of steel piano wire which can be depended upon for uniformity in fiber and temper. These ringers can be applied to the magneto or common battery telephones of any manufacture. The simplicity of the apparatus makes it a very easy matter to install it, even by persons comparatively inexperienced.

A NEW PAY STATION.

The Graeber-Entrikin Manufacturing Company, of Philadelphia, which advertises a new pay station in this issue, has a paid-up capital of $150,000. Frederick R. Graeber is president and treasurer; Clarence T. Entrikin, vice-president and engineer, and George W. Garman, secretary and general manager. The executive offices of the company are conveniently located at 501-502 Keith's Theater building, 1116 Chestnut street, Philadelphia, Pa., and branch offices are to be opened from time to time throughout the country. The object of the company is to manufacture and deal in telephone apparatus, specializing on the "Invincible" register pay station, "Invincible" receiver holder, and from time to time bringing out new toll devices and the smaller apparatus used in telephony. The company's factory is located in Philadelphia, and is equipped with modern machinery with every facility for producing only meritorious goods and in large quantities. Only a good grade of goods will be manufactured. The "Invincible" pay station is said to be the result of many years' experimental work, which it has cost thousands of dollars to produce. This machine registers nickels, dimes, and quarters, as they pass through the machine and gives the total amount of money in the machine. The register is concealed and can only be read by an authorized person. The coin and electrical mechanism is portable and the inspector working on this part of machine has no access to register or money. The money is in a separate compartment under a combination lock. The collector has access to money only. The machine is made of pressed steel. Each part is interchangeable and lifts out of case complete. The machine is of graceful design and can be used as a complete portable set, both with and without the stand, and on a wall set. It will fit any kind of standard equipment. Only good coins of the proper dimensions operate the machine. Only one coin can be placed in the machine at a time. Code signals are used. When the receiver is hung up, entire apparatus is locked out.

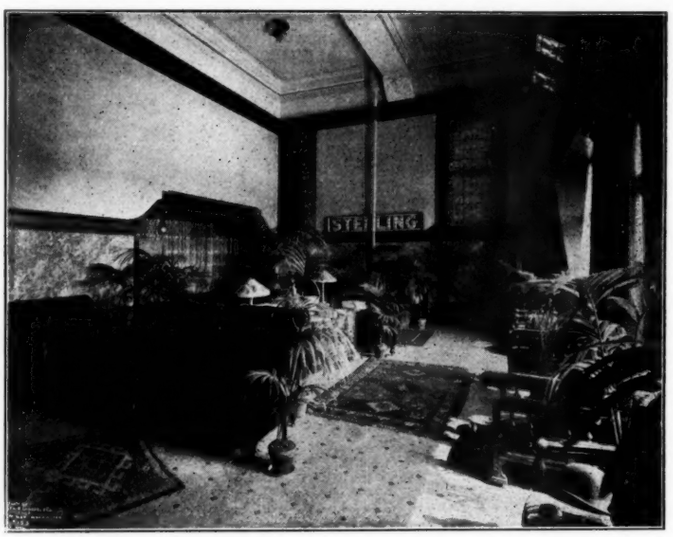
In other words, the object of the invention is to anticipate any weak points or trouble heretofore experienced and to eliminate them. The machine is pronounced simple in construction and, it is claimed, will reduce the cost of maintenance fifty per cent. A catalogue and price list of "Invincible" goods will be mailed, together with information covering the apparatus, upon request to the company. Mr. Graeber is a well known financial and business man who has been identified with many telephone enterprises in the east. Mr. Entrikin is an engineer of good standing and will handle the manufacturing end of the company. Mr. Garman is a telephone man of broad experience and good executive ability. The company will have the advantage of his many years of experience in the telephone field. An invitation is extended to everyone interested in telephone apparatus and a cordial welcome is assured them.

STERLING ELECTRIC EXHIBIT.

One of the most attractive exhibits at the International convention at Chicago in June was that of the Sterling Electric Company, of Lafayette, Ind. As the accompanying illustration shows, the Sterling occupied one of the reading rooms at the Auditorium, which was elaborately decorated for the comfort of the many visitors who called.

Usually at affairs of this kind the Sterling company has been content to exhibit apparatus, such as telephones, magneto, common battery and multiple switchboards, together with a full line of protective apparatus, but this year there was not a single piece of apparatus in the Sterling room, all samples being kept upstairs on the fourth floor, suite 422, to which visitors who wished to talk business were invited to go. This left the writing room free for entertainment only, and everybody was made welcome from 7 o'clock in the morning till 12 at night the entire three days, and the register shows that everyone who attended the convention visited Sterling headquarters, all of whom expressed their admiration and congratulations.

Steinbach's orchestra furnished music at the Sterling exhibit and proved a delightful feature of the entertainment. The following officers and employes of the Sterling Company represented the concern at the convention: W. E. Doolittle, president; W. R. Coffroth, secretary and treasurer; S. B. Fowler, electrical engineer; E. S. Shelby, sales manager; H. T. Doolittle, purchasing agent; H. W. Doolittle, superintendent order department; A. K. Keller, factory superintendent; C. R. Brown, sales engineer; O. P. Reed, sales engineer; G. S. Skinner, chief draughtsman.



Sterling Electric Company Exhibit.

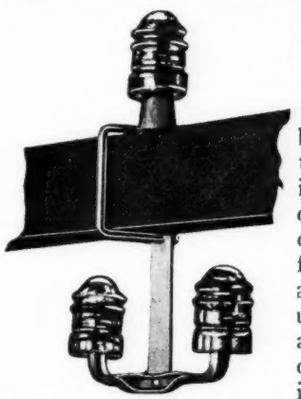
PEIRCE SPECIALTY COMPANY'S NEW OFFICES.

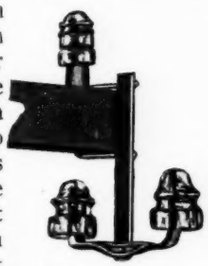
The Peirce Specialty Company announces the removal of its Chicago sales and purchasing office to room 508, 48 East Van Buren street, where it is always ready to welcome its many customery and friends. The company also announces that owing to the continued steady demand for its product by telephone and lighting companies in the south and southwest that it will shortly open up a St. Louis branch office under the supervision of its popular representative, Ralph Lane Crane. Suitable location is now being contracted for but until the establishment of same Mr. Crane will

receive his mail at 4918 Forest Park boulevard. Mr. Crane has been connected with the Peirce Specialty Company for some time, and has developed a following among the telephone and lighting companies of the West and Southwest highly creditable to him. No doubt his friends and acquaintances will gladly co-operate with him in making this new venture a decided success.

NEW STYLE OF UNDERHANG BRACKET.

The Peirce Specialty Company, Elkhart, Ind., and Chicago, Ill., calls attention to the redesigning of its well-known underhang bracket, two illustrations of which we show herewith. One shows the bracket used to furnish the additional pin room with the bracket put on the cross arm in the center or along side of a pin which furnishes two additional pins underneath the arm at a great deal less than it would cost to erect additional cross arms along the road. It also has this further advantage that, if, at any time, the service grows large enough to demand an additional cross arm, these brackets can be taken down and used elsewhere as the service warrants. The smaller illustration shows the bracket placed at the end of a cross arm, in which manner it does not necessitate taking off the end pin as is the custom with other brackets and is illustrative of the method of erecting this bracket when it is desired to use it as a break arm; to drop off at right angles to the route, or for telegraph loops, etc. This company has recently issued a handsome catalogue, which it will mail upon request.





SERVICEABLE OPERATORS' CHAIRS.

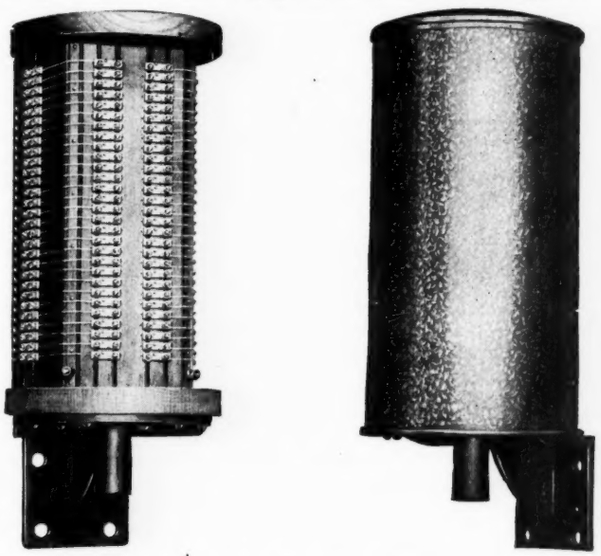
Buyers of telephone chairs are coming to realize more and more each year the importance of purchasing that which is substantial and durable, rather than that of flimsy construction or temporary in character. Especially is this true of chairs, which are quite an essential feature of every telephone exchange and one calling for considerable attention and study. There is probably no other business in the world where chairs are constantly employed, both day and night, as is the case of telephone operators' chairs. For this reason these chairs must not only be comfortable, convenient and sanitary in design and material, but must be of an especially substantial and durable construction. In fact, perhaps, the kind of service which some telephone companies furnish may be in a large part attributable to the good, bad or indifferent quality of the chairs utilized by the operators. Operators who give quick, pleasant and satisfactory service are those usually who enjoy health and are comfortably situated while at work.

Richards' Toll and Switchboard Operators' Chairs.

The Richards Chair Panel Company, with head offices in the Woman's Temple building, Chicago, enjoys the advantage of having a basic patent on a feature said to be possessed by no other chair on the market, to-wit: a semi-flexible, pivotal back, which not only affords a broad yielding support, but gives it just enough rigidity to make its use a comfort and pleasure at all times. This "Ideal" operator's chair is enthusiastically endorsed, it is said, by telephone operators in nearly all of the better class of exchanges where it has been introduced, on account of being exceptionally easy, and durable as well as attractive. The same chair, adapted to the use of toll operators, can also be had of the same concern. The Richards Chair Panel Company is one of the well-known concerns in Chicago, having for many years been extensively engaged in the manufacture of high class chairs for opera houses, railroad parlor cars, etc. Its chairs cost a trifle more than the ordinary chair, but it is claimed for them that they will outlast two of the average operators' chairs, and will give greater satisfaction while in use. Every manager or buyer who considers quality in equipment and service should at least give the Richards Chair Panel Company an inquiry before purchasing that sort of equipment.

NEW TYPE OF CAN TOP CABLE TERMINALS.

The new protective can top cable terminals being introduced by the Protective Electrical Supply Company of Ft. Wayne, Ind., are attracting general attention throughout the field. It is claimed that these terminals not only protect cables from lightning and high and low tension power currents of all kinds, but are inexpensive, low in fuse maintenance, dispense with pot heads, and are easily installed. We quote the following claims and specifications from one of the company's folders:



A New Can Top Cable Terminal.

"Bracket castings are all galvanized. Cabinets are made of thoroughly seasoned hard maple, and are treated by a linseed oil process, making them absolutely moisture proof. Rear panels of cabinets are removable. Inside of cabinets form the pot head. Cable conductors are threaded through holes in front panel to connecting terminals.

"Connecting terminals are made of brass and can be furnished for either screw or soldered connections. The inside of the cabinet, which forms the pot head, is hermetically sealed with an insulating compound. Distributing wires are brought through opening provided for in casting to the

rear of cabinet, and are then threaded through holes in side panels to the connecting plates.

"Brass ground plates are arranged at corners between front and side panels. Glass insulation being placed on both sides and extending slightly above the top surface of brass ground plates. German silver fuse wire, each 3¼ in. long, connect the distributing wire connecting plates on side panel, with the cable conductor connecting plates on front panel. The connecting plates being mounted at almost right angles from one another, making it impossible for currents to arc from plate to plate. A galvanized iron case is used to cover the entire terminal."

"IRONITE," THE NEW DUPLEX DROP WIRE.

The Durant Electrical Supplies Company, 59 Fifth avenue, Chicago, has produced a special wire of its own in the shape of a duplex drop wire which is styled "Ironite." The most attractive feature claimed for this new drop wire is its economy. At the prevailing high prices of copper duplex copper wire is an expensive luxury, and there will

undoubtedly be a great many more telephone companies who will welcome "Ironite" as a very acceptable substitute.

The Durant Electric Supplies Company states that every inch of "Ironite" is made according to the most rigid specifications. It is a rubber-covered, braided, twisted and saturated wire. Only the best grade of cotton is used in the braiding, and it is braided very tight. It is guaranteed to stand the standard tests for insulation. The producers claim that the tensile strength of "Ironite" is twice as great as that of copper and that it consequently makes a more satisfactory drop wire, as it will not stretch. The conductivity is sufficiently good for the short lengths ordinarly used for drops. The price is said to be at least twenty-five per cent less than the price of copper wire.

"Ironite" is furnished in No. 16 and No. 18 British wire gauge, the insulation of the No. 16 being 5/32 inch and of the No. 18, 4/32 inch. Some of the largest companies in the country already have adopted "Ironite" as their standard drop wire. The Durant Electric Supplies Company will be glad to give more information and to furnish quotations on request.

'FLEXIPHONE" WINS A WELCOME.

The "Flexiphone" appears to be "making good," as predicted. Telephone men very naturally turn to apparatus designed to eliminate trouble and expense due to breakage and kinking of the conductor cords, and, to better the service to the subscriber by having a telephone that would be quickly accessible to any one sitting or standing, and yet always out of the way. The "Flexiphone" is made by the Oliver Manufacturing Company, Philadelphia, and the Holtzer-Cabot Company, Chicago and Brookline, Mass.

LINEMEN'S SOLDER PASTE.

The Chase-Shawmut Company, of Newburyport, Mass., has placed on the market a new red solder paste. Electricians, linemen and others have often need for a convenient solder flux in such form as to be clean to handle and at the same time efficient. The red "E" solder paste, although new to the general public, has been used and tested for a number of years by individuals and found in every way satisfactory.

It is put up in collapsible tubes so that there is no waste, and it can be carried in the pocket or tool bag with perfect cleanliness. The paste is non-corrosive and does not act like an acid, but cleans the surface, and its action as a flux makes the solder run freely. Temperature, weather or material makes very little difference. It will keep indefinitely and is put up in two sizes of tubes, one ½ x 5 inches and the other 1 x 6 inches long.

CEDAR POLES AND BIBLICAL HISTORY.

The Valentine-Clark Company, Chicago, in addition to telling the trade just why it may expect prompt and correct service from that company, also presents some very interesting history, in unique form, through the medium of a folder which it is now sending out. We quote from the circular as follows:

"King Solomon hauled cedar poles from Mount Lebanon to Jerusalem to build the temple—and King Solomon is said to have been the wisest man that ever lived. If he needed poles that combined the greatest strength, lightness and durability with beauty and straightness, he made no mistake in hauling cedar. There's another great reason for selecting cedar poles—economy. Do you know it costs more to erect a cheaper, heavier, inferior pole than it does a cedar? Then if cedar lives longer, looks better, gives better service and costs less to erect than cheap poles—don't you want cedar poles? There were no car famines in Solomon's day. His freight facilities were poor. But ours are the best in the history of the pole business."

A SUCCESSFUL TELEPHONE HOUSE.

The Central Telephone & Electric Company, of St. Louis, Mo., has established a branch office at 120 Liberty street, New York, in charge of A. F. Brown, owing to its rapidly increasing export trade and business from exchanges in eastern states. Mr. Brown will be pleased to answer any inquiries or make quotations on telephone apparatus, switchboards and a full line of all construction materials for installing complete exchanges.

The Central company also advises that its branch installed at Dallas, Texas, some six months ago has secured such a large volume of business that the store room at 237 Commerce street has become too small, and after July 1st will occupy a large two-story warehouse with direct track facilities at 105-107 Commercial street, at Dallas, car lots shipments being warehoused and distributed with utmost dispatch to nearby states.

These are evidences that the Central Telephone & Electric Company is, as it claims, the fastest-growing telephone house in the United States. It claims there is a reason, which it will gladly tell prospective customers on request.

ELECTRICAL MEASURING INSTRUMENTS.

The Leeds & Northrup Manufacturing Company, Philadelphia, Pa., have just issued its 1907 catalogue, describing the complete line of electrical and scientific instruments which this company manufactures. This firm's manufacturing facilities are also very attractively described. The following instruments are new and are enumerated for the first time in this catalogue: No. 2400, portable telescope galvanometer; No. 4305, Kelvin bridge, direct reading ohmmeter, dial decade portable testing set; No. 5420, fault-finder; No. 5365, bridge for locating faults in power circuits; No. 7000, alternating current- direct current comparator; No. 5313, alternating current generator and speed controlling apparatus, page 116; and line of resistance thermometers.

NEW KANSAS CITY MANAGER.

The Swedish-American Telephone Company reports that business from its branch at Kansas City is showing an increase. C. R. White, familiarly known as "Bob," is now in charge of the Kansas City office. Mr. White is an old-time telephone man and a fine fellow, and no doubt within

a very short time will have a wide circle of friends and acquaintances throughout the west. Swedish-American customers are assured that when they send their orders to Kansas City, shipments will be promptly made, as well as from the factory in Chicago. Mr. White will cordially welcome visiting telephone men, and invites all who visit Kansas City to call on him at 113-115 West Sixth street.

RED "E" SOLDER PASTE.

Electricians, linemen and others have often asked for a convenient solder flux in such form as to be clean to handle and at the same time efficient. The Chase-Shawmut Company claims to now have something that will appeal to everyone, whether at work soldering on the top of a pole, or mending a tin pan in the home. Red "E" solder paste, although new to the public, has been used and tested for a number of years by individuals and found in every way satisfactory. For work where only a little paste is needed, such as line, laboratory or shop work, there is said to be nothing so clean and convenient. It is put up in collapsible tubes, so that there is absolutely no waste, and can be carried in the pocket or tool bag with perfect cleanliness. Red "E" solder paste is non-corrosive and does not act like an acid, but cleans the surface, and, acting as a flux, makes the solder run freely. Temperature, weather or material makes very little difference, it is claimed, and it also will keep indefinitely and is Red "E" at any time and in any place. It is put up in two sizes of tubes, one ½ x 4 inches and the other 1 x 6 inches long. The price is low and telephone linemen and electricians who have tried it pronounce it just what they want.

GEM WIRE AND CABLE GRIP.

The Colman J. Mullin Company, of Brooklyn, N. Y., has recently issued a very complete and interesting folder, descriptive of its "Gem" wire and cable grip. The points of superiority which are claimed for this device are well brought out and should prove of interest to those who have use for apparatus of this kind. Copies of this folder will be furnished free upon application.

A FARMERS' TELEPHONE BOOK.

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., has prepared an exceptionally attractive book, entitled, "How the Telephone Helps the Farmer." It should be extremely useful to those who are engaged in promoting rural line development.

HENRY TIDEMAN'S NEW COMPANY.

The Menominee (Mich.) Insulated Electric Wire Company has been organized with a capital of $100,000. Henry Tideman, president of the concern, who is widely and favorably known throughout the telephone field, is now on a tour of Europe. The new company is composed of local capitalists.

TELEPHONE SUPPLIES.

Illinois Electric Company, Chicago, Ill., would like to send all prospective purchasers of telephone supplies its latest stock list, embracing quotations on cross arms, pins, insulators, brackets, bolts, braces, pole steps, wire, guy rods, ground rods, strand, clamps, connectors, and all other supplies necessary for building complete telephone exchanges, excepting telephone apparatus itself.

PREMIER ELECTRIC COMPANY'S NEW LINES.

The Premier Electric Company has recently moved to larger and more convenient quarters on the ground floor at 141 S. Clinton street, Chicago, Ill. It will continue to handle the well known Premier B. B. switchboard cord, and will also carry a line of inter-communicating telephone apparatus and voltmeters.

DEARBORN TELEPHONES.

The Dearborn Electric Company, Chicago, is making very attractive prices on its telephones. Dearborn telephones are claimed to be unequaled in quality and to give perfect satisfaction both for toll line and exchange use. At the prices, for which they are now selling, they should be of interest to every telephone buyer.

THE COMPENSATING MICROPHONE

A Description of this Device Furnished by Zurcher Telephongesellschaft Actiengesellschaft fur Electrotechnik.

IN microphones the action is produced by variations of pressure in loose contacts. It is clear, therefore, that it must be possible to obtain a stronger effect by an augmentation of the loose contacts; in fact almost all microphones now in use have several loose contacts. The contacts are generally placed behind the diaphragm, and in consequence of this disposition only the increase and reduction of pressure produced on that side of the diaphragm are utilized notwithstanding the fact that the vibrations of the diaphragm would act on contacts placed before it at the same time but in contrary direction.

Many attempts have been made with the object of utilizing the vibrations of the diaphragm in both directions and of constructing double-acting microphones, and several patents have been granted for such microphones, but none of these apparatus has come into use.

No doubt, all suffer from the drawback, that the inventors did not succeed in getting equal changes of the resistance for the to and fro vibrations of the membrane, and so the reproduction of speech could not be clear.

With the new compensating microphone it is claimed this effect is attained, and so there is no doubt it will be a first-class apparatus, especially for long-distance telephony.

In local plants it is possible that ordinary apparatus will do, because the relatively short lines do not require the very best apparatus. In reality even for this service only the best apparatus is sufficiently good, but for long lines, for a correspondence between distant places, such a special apparatus is quite indispensable, the great resistances of the line wires and the other disturbing circumstances require especially good instruments.

The new microphone is constructed as follows:

The diaphragm *a* of the accompanying drawing is attached by springs to a shoulder of the metal box *c* so that it can vibrate freely. In front of the diaphragm and near the mouthpiece of the apparatus a metal plate *g*, perforated in the center, is secured to the edge of the box, and to the inner side of this plate, that is, before the diaphragm, is fixed a ring of carbon having little cavities *f* on the face turned to the diaphragm. These cavities contain granules of carbon. On the reverse side of the diaphragm is placed a carbon disc having also such cavities filled with granules of carbon.

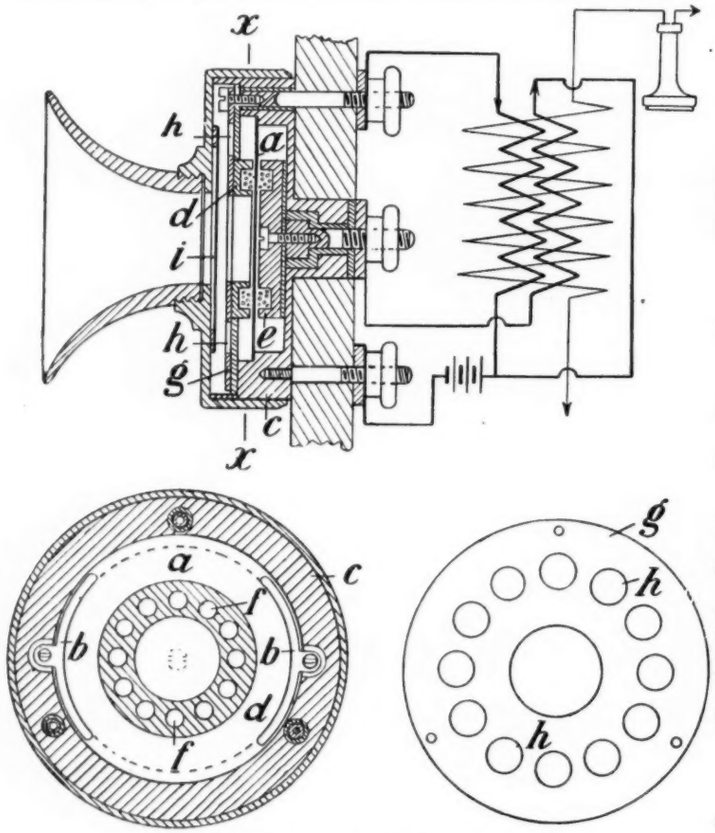
The apparatus being placed so that the diaphragm is in a

vertical position, the granules touch the diaphragm on both sides and establish contact as in other granular microphones.

The different parts of the apparatus are connected so that the electric current coming from the battery reaches the diaphragm, and here it is divided into two branches. One branch passes through the granules placed before the diaphragm to the carbon ring, and the other branch goes through the granules placed behind the diaphragm to the carbon disc.

The induction coil has two sets of primary windings, each of which is passed by one of the branches of the current. Both sets are wound in the same direction but connected with the opposite poles of the battery, so that they produce an induction current in opposite directions.

By the use of the ring the object is attained that the sound waves may reach the diaphragm in the center without any hindrance; and consequently the vibrations of the membrane going on in concentric circles must affect all the



The Compensating Telephone.

contacts situated on one side of the membrane in the same direction and with equal force, and also that the effect produced on the contacts placed on the other side is in an opposite direction. Consequently a reduction of the pressure and an increase of the resistance on one side of the diaphragm correspond to an increase of the pressure and a reduction of the resistance on the other side and vice versa. The variations of the intensity of current caused by these variations of pressure, must be of the same strength in the contacts before the diaphragm and in those behind it, because the diaphragm having made a vibration in one direction must make a vibration of the same amplitude in order to return to state of repose. A disc of varnished linen or a similar material *i* is fixed at the mouthpiece in order to prevent the access of moisture to the loose contacts during conversation. This is necessary, because otherwise the apparatus would soon become unserviceable.

The two sets of primary windings of the induction coil producing an induction in an opposite direction and being connected with the opposite poles of the battery as mentioned above, the inductive actions on the secondary windings produce a cumulative effect.

Another construction based on the same principle would consist in a diaphragm fixed in its center instead of being fixed by the springs *b* on the edge.

The excellent quality of the new apparatus can be shown by a simple calculation, which, moreover, is corroborated by practice.

Let T be the intensity of current in the undivided part of the circuit, T_1 and T_2 the intensities of current in the two branches, $r = 2.5$ ohms the resistance in the undivided circuit, $r_1 = 5$ ohms the resistance of one branch, $r_2 = 5$ ohms the resistance of the other branch (comprising in r_1 and r_2 the battery, the respective loose contacts and a set of the primary windings), E the electromotive force of the battery equals 3 volts.

Then we have in the state of repose

$$\frac{E}{r + \frac{(r_1 \times r_2)}{r_1 + r_2}} = \frac{3}{2.5 + \frac{(5 \times 5)}{5 + 5}} = 0.6 \text{ amp.}$$

$T_1 = 0.3$ amp. and $T_2 = 0.3$ amp.

If now by the sound-waves the resistance of the contacts placed before the diaphragm decreases 2 ohms, it is increased 2 ohms in the contacts placed behind the diaphragm. So

r_1 is 3 ohms and $r_2 = 7$ ohms.

So we have

$$T_1 = \frac{3 \times 7}{(2.5 \times 3) + (2.5 \times 7) + (3 \times 7)} = \frac{21}{46} = 0.4565 \text{ amp.}$$

In comparison with the intensity of current in state of repose we have an increase of 0.1565 amp. On the other side we have $T_2 = \frac{3 \times 3}{(2.5 \times 3) + (2.5 \times 7) + (3 \times 7)}$ = 0.1956 amp., that is less 0.1044 amp. The sum of the variations producing induction will therefore be 0.2609 amp.

The result is quite the same if we consider in the first place the effects of the vibrations of the diaphragm towards one or towards the other side. With a microphone having loose contacts only on one side of the diaphragm, we find the following result, supposing the conditions for the rest to be same: $(E = 3, r = 5 + 2.5)$.

In state of repose the intensity of current is: $\frac{3}{7.5} =$ 0.4 amp.

By an increase of the resistance of 2 ohms the intensity of current is reduced to $\frac{3}{9.5} = 0.3158$ amp.

By a reduction of 2 ohms the intensity is increased to $\frac{3}{5.5}$ = 0.5454 amp.

In the first case the reduction in comparison with the intensity in state of repose is 0.0842 amp., and in the second case the increase is 0.1454 amp.

The inductive action of the new microphone being 0.2609 amp. as shown, is more than three times as strong as the inductive action of an ordinary microphone, if we compare the reduction of the intensity of current caused by a reduction of the pressure, and almost double if we compare the increase of pressure and the increase of intensity of current caused by this increase of pressure. In both cases the effect is considerably intensified. But the calculation shows also another advantage perhaps still more important. As the

induced current reproduces what is spoken into the microphone, the reproduction will be the more clear and distinct, the more the variations of intensity of current in the primary windings of the induction coil correspond to the vibrations of the diaphragm, that is the more they are in proportion with them. As the above calculation shows, the increase of intensity of current caused by a reduction of the resistance of 2 ohms is almost double the reduction caused by the increase of the resistance of the same value (0.1450 : 0.0842). Exactly the proportion is 1722 : 1000.

With the new microphone the variation causing induction is always of the same value, that is, always in the proportion 1000 : 1000.

If we compare the action resulting from different variations of the resistance, we find the following result:

An increase of the resistance in one branch of the circuit of the new microphone of 0.1 ohm and therefore a reduction of the same value in the other branch, produces in the first branch an intensity of current

$$T_1 = \frac{3 \times 4.9}{(2.5 \times 4.9) + (2.5 \times 5.1) + (4.9 \times 5.1)} = 0.294058$$

amp., that is in comparison with the current flowing in state of repose, a reduction of 0.005942 amp.

In the other branch the intensity of current is

$$T_2 = \frac{3 \times 5.1}{(2.5 \times 4.9) + (2.5 \times 5.1) + (4.9 \times 5.1)} = 0.006061$$

amp., that is 0.006061 amp. more than in state of repose.

That makes altogether an inductive action corresponding to a difference of intensity of current of 0.012003 amp.

For an increase and a reduction of the resistance of 2 ohms the variation of the intensity of current producing the induction exactly proportional would be $20 \times 0.012003 =$ 0.24006 amp., but in fact it is, as mentioned, 0.2609 amp.

This is a rate of 1000 : 1087, which is a very little deviation from proportionality.

With an ordinary microphone under the conditions shown above an increase of resistance of 0.1 ohm produces a reduction of intensity of current to $\frac{3}{7.6}$, that is a difference of 0.0053 amp.

For an increase of resistance to 2 ohms, that is the twenty-fold, the reduction of the intensity of current should therefore be 0.106 amp., whilst in reality it is 0.0842. This is a relation of the reduction as it is calculated proportionally to the real reduction of 1000 : 1259.

A reduction of the resistance to 0.1 ohm produces an increase of the intensity of current to $\frac{3}{7.4}$, that is 0.4054, and a difference of 0.0054 amp.

For a reduction of the resistance to 2 ohms, that is twenty-fold the proportional increase of the intensity of current should be 0.108 amp., but as has been shown above, it is in reality 0.1454 amp.

The relation of the two figures is 1346 : 1000.

In practice this appears very clearly, through the fact that ordinary microphones fail when they are loudly spoken at, that is the voice gets shrill and indistinct, and just in speaking over long lines we are induced to speak as loudly as possible because we hear that the sound coming from the other post arrives only very feeble.

It is true that for the clear reproduction of speech there are also other circumstances to be taken into account besides proportionality of the variations of the intensity of current, but they are of no importance here, because they are the same for the different systems of microphones.

The construction of the new microphone renders it possible to use a greater number of loose contacts to a rather large extent and consequently to use a stronger battery than is possible with other microphones. And by that means we may obtain another augmentation of the effect.

The new microphone is patented in different countries.

SODIUM TRANSMISSION LINES.

According to the consular reports the use of sodium for overhead transmission is attracting the attention of electricians. It is said to be cheap and a good conductor of electricity, but as its marked affinity with oxygen causes it to ignite when placed in contact with water, its employment in the form of a conductor would be limited, probably, to overhead transmission lines or feeders for railway work. The general process of constructing sodium conductors is to take standard wrought-iron pipes and heat them to a point well above the melting temperature of sodium. The sodium is then melted in special kettles and is run into the pipes, solidifying when cool. There is said to be no marked depreciation of either the sodium or the pipe if the latter be properly protected by a coat of weather-proof paint.

For the same conductivity the price of the complete sodium conductor is much below that of copper cables, being in small sizes not more than fifty per cent and in large sizes not more than twenty per cent of the cost of copper. For instance, a half-inch wrought-iron pipe filled with sodium has a capacity of 109 amperes, and costs about three and one-half cents per foot, against eight and one-half cents for a copper line of the same capacity. A six-inch sodium conductor would carry 8,130 amperes, the cost of the line being about $1.40 per linear foot, as compared with $6.30 per linear foot for copper. These figures were estimated on the basis of seven and one-half cents per pound for sodium and sixteen cents per pound for copper.

TELEPHONE TROUBLES IN NEW YORK.

New York patrons of the Bell company are resorting to various means to demonstrate their dissatisfaction with the inadequate telephone service and the arrogant policy of that corporation toward subscribers. The subscribers have tired of verbal protests and writing letters to the papers complaining of the situation. A prominent real estate broker of Harlem, who lives in the Washington Heights district, took a novel way to avenge himself on the telephone company, and, strange to say, the latter made no effort to punish him. From his home the real estate man had vainly tried for more than an hour to get into telephonic communication with a friend living in another section of Harlem. Despite the fact that he knew his friend was waiting for him to call him, "Central" insisted repeatedly that he "wouldn't answer."

Waiting until he lost his patience the real estate broker left his house and hurried to the Audubon Exchange, 156th street and Amsterdam avenue, where he found only three young girls on duty at the large switchboard. They refused to admit him and be kicked in the door. Entering the room he demolished all the furniture in sight, throwing the girls into a fright.

After he had broken up the fittings the man calmly walked out of the exchange and into the arms of Policeman Barry, of the West 152d street station, who had been summoned by one of the girls. The telephone company, however, desiring to avoid notoriety in connection with the affair, refused to prosecute the man.

The telephone plays an important part in the work of the Southern Pacific Railroad in fighting against the flooding of the land by the Colorado river at the Salton sea. The road has placed telephones 500 feet apart along the levee so that men on guard can warn the others when there is a leak in the dike at any particular place.

ITEMS FROM THE RURAL LINE DISTRICTS

Illustrated by O. H. Brandenburg

William Badour, who is in the employ of the Citizens' Telephone Company here, is ill with the mumps.—*Allegan (Mich.) News.*

The weather, the roads and the telephone lines are not just what they might be in this neighborhood.—*Pleasant Grove Correspondence Greenup (Ill.) Press.*

Ami Lewis, manager of the Emington telephone exchange, transacted business here Wednesday and swopped telephone yarns with A. C. Schrader.—*Cabery (Ill.) Enquirer.*

A. P. Glenn, formerly in charge of the telephone company in this city, is manager of the Empire vaudeville theater in Ft. Madison, Iowa. In connection with his other work, Mr. Glenn sings the illustrated songs.—*Pekin (Ill.) Commercial.*

The Nelson Telephone Company will soon have wires strung all over the county. Nelson never does anything by halves. The only halves we have here are widowers, widows, bachelors and maids, and if all signs do not fail these people will soon do their duty.—*New Alexandria (Minn.) News.*

Adolph and Franz Peterson are working hard to get the rural telephone line through as far as F. L. Bunker's place. They now have shareholders enough to build as far as J. Hartung's place. It seems as if a few of our farmers do not know the value of a telephone.—*Long Prairie (Minn.) Leader.*

For the past fifteen years W. A. Bennet, head linesman of the Summerville Telephone Company, has been carrying about on his neck a compound tumor which he might have been rid of years ago, had he consulted the doctors who last week removed the disfigurement.—*Punxsutawney (Pa.) Independent.*

The telephone line is nearly completed and nearly everybody along the creek have boxes. They all seem to appreciate the pleasure of speaking to one another. It is an easy matter to find out what each one is going to have for dinner and how many chickens the old hens hatched at their last brood.—*Fish Creek Correspondence Moundsville (W. Va.) Echo.*

A telephone line has been constructed and is in operation from Jones' to Hogg's, a distance of eighteen miles. We would like to have the Bell telephone line come from Lusk to Hat creek and thence down Sage creek to Old Woman creek, as it is in direct line to the one that comes from Edgemont and could then join that at John Hogg's.—*Cheyenne (Wyo.) Tribune.*

COME ON UP GIRLS
WHO SAID THE PEACH CROP IS A FAILURE
HEY! GIRLS WATCH ME SKIN A CAT
JUST ONE MORE BOOST MAYME
HEAVENS! LAURA I'LL HAVE TO LET YOU DROP

Eight girls, employed by the Home Telephone Company, Santa Barbara, have quit work because their manager told them that their conduct on a picnic last Sunday was unladylike. The manager told the girls they could either return to work or be locked out, and as the girls refused to return their places will be filled with other girls. The eight girls held a picnic Sunday, at which the principal diversion was climbing trees. The complaint against the girls was entered by one of the principal stockholders of the company, who observed the girls returning from the picnic.—*Correspondence in San Jose (Cal.) Mercury.*

One of our citizens of an inquiring turn of mind was prompted to investigate the mysterious working parts of the transmitter on his telephone last week and, taking it apart, he spilled the granular carbon. Here he was strictly "up against it," figuratively speaking, when he bethought himself of some gunpowder he had in the house, which almost identically resembles granular carbon, which be substituted, put it together again with a sly wink as much as to say that he could give Frank Doring pointers in the telephone business, rang up, pulled the receiver off the hook, which released the electric current when bang went the transmitter in his face with the sound of a cannon. He settled all damages and is keeping very quiet.—*Gratiot (Wis.) Reporter.*

The Volga Mutual Telephone Company has commenced business in the town of Maynard and the surrounding country with its central office located in P. C. Borcher's harness shop. We have connections with almost every town and county in the state of Iowa and we kindly ask our fellow farmers to build lines in and connect with us.—*Maynard (Ia.) News.*

While working in the Imperial Hotel assisting in the installation of a new telephone system, yesterday morning, Axel Landeen, 18 years old, residing at 935 Brockman street, was seriously injured by a 1,000-pound weight that fell from the bottom of the elevator and struck him on the head. He was badly cut and bruised and was removed to the Good Samaritan Hospital. It is thought he will recover.—*Portland (Ore.) Oregonian.*

Ole Kittelson, lineman for the long-distance lines and connections of the local exchange of the Northwestern Telephone Exchange company, went to Hines Spur last evening to attend to some difficulties that had been experienced at the long-distance station there. The bell on the 'phone bell which had been in use there for some time would not ring and the lineman replaced the defective instrument with another that will "do business."—*Bemidji (Minn.) Pioneer.*

Felix Rushaw has resigned as electrician and manager of the lines of the Camden Telephone Company to play ball this coming season with Fairmount, W. Va., in the Western Pennsylvania League. He will hold down the position in center field. Mr. Rushaw left Friday for his home up state, where he will rusticate before donning the diamond armor. Mr. Rushaw's management of the local office was very gratifying to the directorate and they were loath to see him leave, as were quite a colony of friends, but overtures were as nothing to the "call of the umpire."—*Camden (O.) News.*

The patrons on the Will H. Smith telephone lines, which consists of six lines, held a meeting some time ago to see what could be done in the way of having better service at Middlecreek, and they held a final meeting on last Wednesday and peace and harmony reigned at all their meetings, and they decided to erect a building for a central office, and the Western Telephone Company donated $30 toward the building, others donated logs and others are sawing the lumber free and the building will soon be erected to the joy and satisfaction of all the people.—*Middlecreek Letter, Plymouth (Ill.) Scribe.*